DOCUMENT RESUME

ED 153 827 SE 024 124

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TITLE Iowa Commercial Pesticide Applicator Manual, Category 3: Ornamental and Turf Pest Control. CS-15.
INSTITUTION Iowa State Univ. of Science and Technology, Ames. Cooperative Extension Service.
PUB DATE Feb 76
NOTE 96p.; For related documents, see SE 024 120-133, SE 023 740 and SE 024 060-061; Colored photographs may not reproduce well

EDRS PRICE MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS *Certification; Entomology; *Environment; *Ornamental Horticulture; *Pesticides; Safety; Turf Management; Weeds
IDENTIFIERS Iowa; *Pests

ABSTRACT

This manual provides information needed to meet specific standards for certification as a pesticide applicator. The first section serves as an aid in the diagnosis and treatment of common problems on some of the more common ornamental plants. Recommended control measures are suggested. The second section provides color photographs of common lawn weeds and suggests control techniques. Environmental and human safety factors are discussed in the last section. (CS)

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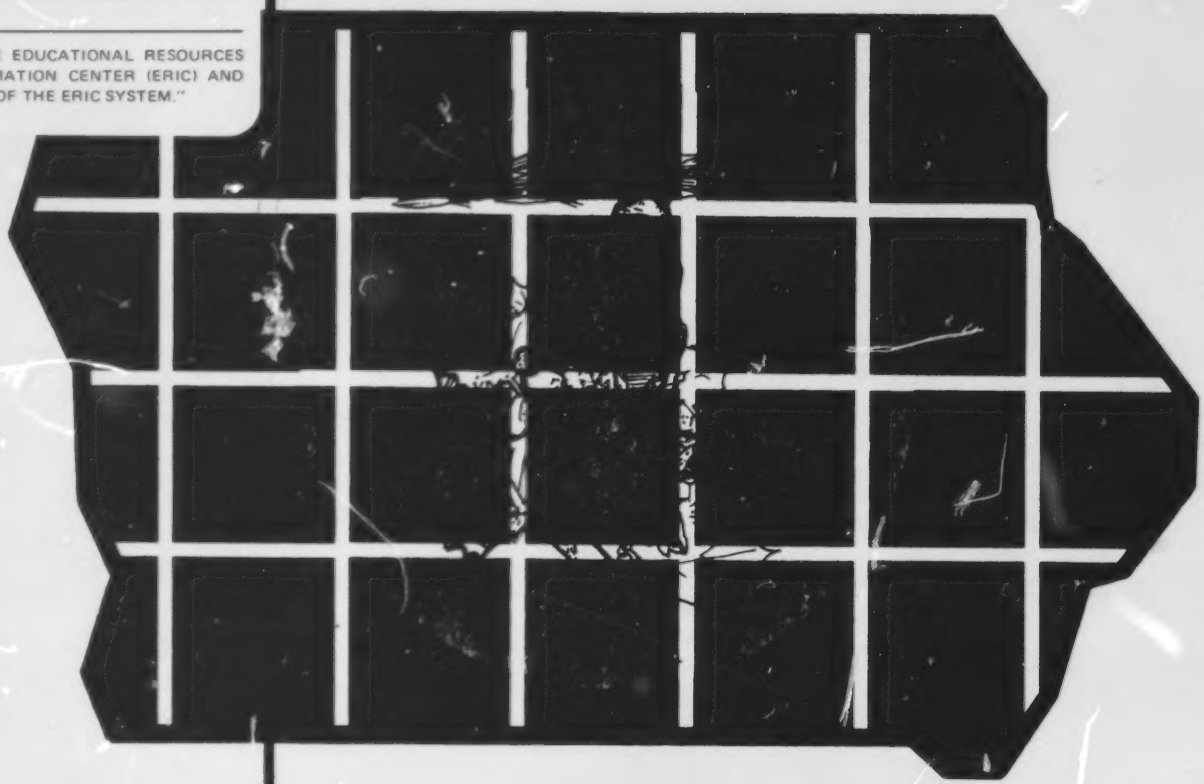
Iowa Commercial Pesticide Applicator Manual

CATEGORY 3

ORNAMENTAL AND TURF PEST CONTROL



This manual is to be used for certification training in conjunction with the U. S. Department of Agriculture – U. S. Environmental Protection Agency manual, **Apply Pesticides Correctly,** EPA-335.

Cooperative Extension Service
IOWA STATE UNIVERSITY
Ames, Iowa 50011

CS-15
February 1976

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This manual has been developed for individuals wishing to become certified in commercial pesticide applicator category 3, Ornamental and Turf Pest Control. It contains specific information that an individual must know before becoming certified in category 3. The manual has been designed to supplement the general information contained in the core manual, Apply Pesticides Correctly - A guide for commercial applicators (plus an Iowa State University supplement) and should not be used for certification preparation without referring to the core manual as well.

Prepared by A. E. Cott, extension horticulturist, Abraham H. Epstein, extension plant pathologist, Vivan M. Jennings, extension weed specialist, and Stephen O. Ryan, pesticide training coordinator, who express their appreciation to the University of Georgia and the University of Missouri for the use of source material.

INTRODUCTION

The customers of ornamental and turf pest control applicators generally have little if any experience in growing plants. Therefore, the applicator must be able to diagnose as well as treat the problem. Proper diagnosis often depends on a knowledge of the natural growth patterns of a plant. Knowing what a normal plant should look like is often necessary in determining the cause of a plant problem or, in some cases, determining if a problem exists.

Many plant problems are not associated with insect or diseases but are the result of some other environmental factor. These problems, often referred to as non-parasitic problems, may cause direct injury to a plant or by weakening the plant, they may make it more susceptible to insect or disease attack. Some examples of nonparasitic problems include nutrient deficiencies, chemical toxicity, air pollution, spray injury, mechanical damage, drought injury including leaf scorch, construction injury and winter injury.

Diagnosing nonparasitic problems often requires a knowledge of the past history of the plant. This includes when and how planted, construction activities in the area, climatic conditions and any other factors that might influence plant growth. The condition of surrounding plants will often give clues that may be helpful in diagnosing a problem.

Determining if a problem is caused by insects, disease or nonparasitic factors may be difficult. Dead spots in leaves which are caused by fungus diseases are usually regular in outline and vary in shades of color on the outside edges. Small black fungus bodies on the dead tissue sometimes help identify the problem. Non-parasitic injury is generally irregular in shape and uniformly colored. Numerous tiny bleached spots on the leaf result from leafhoppers or spider mites feeding on the foliage. These spots may be close enough together to give the entire leaf a yellow or bleached appearance. A uniform yellow color with veins and midrib remaining green is more likely caused by mineral deficiency.

Leaf curl or distortion that appears as tightly rolled or curled leaves is usually caused by aphids. Leaf distortion that appears as cupped foliage, distorted leaf shape or marginal chlorosis is generally caused by herbicide injury.

Cankers are sunken areas in the bark indicating injury to tissue beneath. They may be caused by physical injuries or disease organisms. Those caused by disease organisms usually tend to enlarge causing progressively more damage.

Root problems are the most difficult type of disorder to diagnose. Sudden death of a tree may result from disease, construction injury, rodent damage or toxic chemicals. Progressive weakening over a period of years may be due to girdling roots, decay, poor drainage, lack of nutrients, changes in grade or planting too deep.

In addition to being able to diagnose a problem, it is also necessary to be able to estimate the potential damage it may cause. For example, defoliation of a shade tree late in the growing season may look serious but actually does little harm to the plant other than detract from its appearance. The same type of injury early in the growing season would limit the current season's growth, and several successive defoliations could seriously damage the tree. Conifers are an exception; extensive defoliation at any time of the year will seriously injure the plant and complete defoliation will kill them.

Applying treatments at the right time is an essential part of any pest control program. Insects that feed on foliage by chewing or sucking should be sprayed when they are present and active on the host. Gall-producing insects and borers must be controlled by protective sprays to prevent adults from laying eggs. Scale insects can be controlled at other times of the year but they are most vulnerable when they are in the crawler stage. Diseases must be prevented by applying protective sprays before the plants become infected. When the damage from a disease becomes evident it is usually too late to spray.

DISEASES AND INSECT PEST OF ORNAMENTALS AND THEIR CONTROL

Successful treatment of ornamental plant problems is based on proper identification, assessment of potential severity, selection of the proper methods of treatment, and applying the treatments at the proper time. The following section was prepared as an aid in diagnosis and treatment of problems on some of the more common ornamental plants. It is not a complete listing of all problems that might occur on these plants, but it does include the more common ones.

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
ARBORVITAE	Diseases			
	Phomopsis Needle and Twig Blight (fungus)	Serious in wet seasons. Needles, twigs, and smaller branches turn brown; gradually die back from tips. Tiny black dots appear later on infected parts. May be confused with normal fall browning, winter injury, spider mites, etc.	Prune and/or remove blighted plants. Spray at budbreak and at 10- to 14-day intervals.	Benlate
	Winter Injury (non-parasitic)	Foliage turns brown and dies back from tips and margins. In severe cases entire plants may die suddenly in late winter or early spring.	Late fall watering to insure plants have adequate water during winter helps prevent damage. Fertilize in spring to help overcome damage. Remove dead wood after growth starts in spring.	
	Insects			
	Bagworm	Brownish larvae in tough, silken, pendant-like bags feed on needles. Overwinter in egg stage in female bags on host. Eggs hatch in late May or early June.	Treat in early June when larvae are small.	Bacillus thuringiensis Cygon carbaryl diazinon malathion Dursban Dylox
	Spider Mites	Small, greenish to reddish, eight-legged mites that suck sap from needles and cause yellowing of plants.	Check for mites. May be present in early June.	Kelthane malathion Dursban Vectran Cygon Di-Syston Metasystox-R Guthion

	Oyster Shell Scale	Bark sometimes covered with brownish-gray scales resembling minature oyster shells. Small, soft, yellowish insects or whitish eggs beneath the scales. There is one generation of the scale each year. Winter is passed in the egg stage.	Usually very difficult to control. Thorough spray coverage essential. Use spray oil as dormant spray. Other insecticides can be used against the crawlers in late May and a second application 10 days later.	superior dormant oil diazinon malathion Zectran
BARBERRY	**Diseases**			
	Anthracnose (fungus)	Tan, brown or purple spots on leaves.	Collect and remove spotted leaves before new growth appears in spring. If serious, use fungicides suggested under Ash anthracnose.	
	Powdery Mildew (fungus)	Whitish powdery mold on leaves.	If serious, apple several fungicide sprays at 7 to 10-day intervals.	Acti-dione P.M. Karathane Wettable sulfur
	Insects			
	(Usually no serious insect problems.)			
BIRCH	**Diseases**			
	Anthracnose (fungus)	Small, irregular, circular brown spots with dark margins.	Follow directions as for Ash anthracnose.	
	Canker (fungus)	Ridges of bare wood are exposed to infection. Sometimes "target" effect.	Remove and destroy cankered branches. Treat pruning wounds with approved tree paint.	
	Leaf Yellowing	Leaves turning yellow throughout crown of tree and falling prematurely.	Caused by leaves losing water faster than it is taken up. Water and mulch trees.	
	Insects			
	Birch Leafminer	Whitish larvae of this sawfly up to ¼ inch long feeding between the leaf surfaces. Overwinter as pupae in soil. Usually two generations per season.	Make application in late May. A second spray application may be needed in late June.	carbaryl lindane malathion Cygon Metasystox-R Di-Syston

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
ASH	**Diseases**			
	Anthracnose (fungus)	Large irregular brown spots, mostly along leaf margins.	Collect and remove fallen leaves. Disease not usually serious enough for fungicidal control except in unusually wet seasons or in locations where air drainage is restricted. Spray when leaves are half grown. Second application 10-14 days later, third only under extremely wet conditions.	Benlate Bordeaux Mixture Kocide 101 Zineb
	Rust (fungus)	Swollen, distorted, gall-like formations on leaves and twigs. Can be confused with insect galls.	Usually not a problem unless host is near alternate host - marsh or cord grasses. Control measures usually not needed, but destroying alternate host will help.	Ferbam Mancozeb Thiram
	Insects			
	Aphids	Small, bluish-black, winged or wingless, cause clumping of leaves at tip of new growth. Usually large quantity of white, fluffy, wax-like material over the deformed leaf clump.	If present, will usually be on young trees.	malathion Dursban diazinon carbaryl
	Ash Flower Gall Mite	Tiny, light colored mites feeding in the male flowers cause gall-like formation of flowers. Flowers later turn black and remain on tree over winter.	Best results with 2% dormant spray oil. Galls do not seriously damage plant but very unsightly.	superior dormant oil Zectran Di-Syston
	Sawflies	Larvae whitish with black or brown heads, up to 3/4 in. long. On leaves during May and June.	Spray when larvae are present.	carbaryl diazinon malathion

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
BIRCH (Cont.)	Insects (Cont.)			
	Bronze Birch Borer	Adult beetle, blackish with greenish-bronze hue, ¼ to ½ inch long, 1/10 to 1/8 inch wide. Larva white, 1/2 to 5/8 inch long with the thorax portion slightly enlarged. Overwinter as larvae in tree. One generation per year.	White birch usually most seriously injured. Most numerous in northern states. Three spray applications usually necessary late May, mid-June, late June.	lindane
	Yellow-necked Caterpillar	Caterpillers up to 2 inches long, head jet black, prothorax orange-yellow, body marked longitudinally with alternate yellow-white and black stripes.	Spray when larvae are present.	carbaryl diazinon malathion
CATALPA	Diseases			
	Leaf spots (fungus) Spot Anthracnose (fungus)	Round to irregular, yellowish-brown to black spots. Spots may drop out, leaving holes.	Collect and remove fallen leaves. Chemical control is not recommended.	
	Powdery Mildew (fungus)	Powdery white patches on leaves. If severe, leaves may wither and drop early.	Collect and remove fallen leaves. If severe, spray weekly or bi-weekly when mildew appears.	Benlate Karathane Wettable Sulfur
	Verticillium Wilt	Leaves on one or more branches wilt, turn brown, hang downward and drop early. Purple to bluish-brown streaks in sapwood under bark.	Cut and remove severely infected trees. Where only 1 to 6 limbs are dead or show wilt, prune affected parts. Disinfect tools, and use wound dressings. Fertilize heavily in early spring to encourage vigorous growth.	
	Insects			
	Catalpa Sphinx	Caterpillars up to 3 inches long, black with dark greenish stripes, black horn on terminal end of body, feed on leaves. One to two generations per year. Overwinter as pupae in soil.	Defoliation usually too late in season to cause serious damage to established trees.	Sevimol

COTONEASTER	Diseases			
	Fire Blight (bacteria)	General and serious. New shoots suddenly appear as if scorched by fire. Leaves cling to twigs. Cankers on twigs and branches may be present.	Prune out blighted parts in dormant season (late summer or fall) or when weather is dry. Dip pruning tools in 70% alcohol or household bleach solution between cuts. Chemical control is not recommended.	
	Insects			
	Hawthorn Lacebug	Adults, dark brown with clear areas near tips of lacy wings. Feed on underside of leaves. Overwinter as adults, one generation per year.	Treat when noted on leaves.	lindane malathion carbaryl
	San Jose Scale	Yellow, soft bodied insects, on the surface of the bark, covered by a grayish shield-like scale, with a dark ripple near the center. Overwinter as partially grown nymphs. Reach maturity about apple blossom time. There are 2 to 6 generations per year.	Dormant spray oil in early spring. Crawler sprays should be applied when crawlers appear, usually mid to late June.	superior dormant oil carbaryl (Sevin) Sevimol Zectran
	Spider Mites	See Arborvitae.		
CRAB APPLE (ornamental)	Diseases			
	Fire Blight (bacteria)	General and serious. New shoots appear as if scorched by fire. Leaves cling to twigs and have "shepherd's crook" appearance.	Do routine pruning in late summer or fall, not in spring, but cut out at once any diseased branches and twigs found during the growing season. Cut 12 to 18 inches below visible infected area. Disinfect pruning tools in solution of household bleach (1 part in 9 parts water) or 70% alcohol or formaldehyde.	Streptomycin (not recommended for home use)

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
CRAB APPLE (Cont.)	Diseases (Cont.)			
	Scab (fungus)	Serious in wet seasons. Dull, velvety spots on leaves. May also appear on flower parts and fruit.	Collect and remove fallen leaves in autumn. Follow regular spray program starting from time when first leaves appear until petal fall, at 6 - 7 day intervals, then at 10 - 14 day intervals for remainder of season.	Benlate Captan Folpet Mancozeb
	Powdery Mildew (fungus)	Whitish powdery patch on young leaves, buds, blossoms and twigs.	When common follow apple spray schedule as under apple scab.	Benlate Dinocap Dikar Sulfur
	Cedar-Apple Rust (fungus)	Pale yellow-orange spots on upper leaf surfaces. "Cluster cups" on underside of leaf spots.	Follow regular apple spray schedule when serious on susceptible varieties.	Ferbam Thiram Zineb Mancozeb
	Insects			
	Aphids	Soft bodied insects, winged and wingless. Suck sap from plants. Life cycle varies for species involved.	Treat when aphids are present.	diazinon Dursban Guthion lindane malathion
	Leafhoppers	Small, elongated, greenish or whitish jumping insects that suck sap from leaves. Life cycle varies with species.	Treat when leafhoppers are present in damaging numbers.	carbaryl Guthion methoxychlor Dursban diazinon
	Round Headed Apple Tree Borer	White, legless caterpillar bores into trunk of tree near ground line. Frass, extruded from tunnel. Adult brownish, long horned beetle with two white stripes on wing covers. Usually a complete life cycle in 3 years.	Wrap trunk of newly planted trees with heavy wrapping paper. Treat lower trunk with spray in early June and make second application in July on trees not wrapped.	lindane
	Spider Mites	See Arborvitae.		

DOGWOOD	Diseases			
	Botrytis Petal Blight (fungus)	Common in wet springs. Irregular brown areas in fading flowers and leaves. May be covered with gray mold in wet weather.	Apply fungicide just before, during and after bloom. If possible, just before wet periods.	Benlate Captan
	Spot Anthracnose (fungus)	Common in wet seasons. Spots of various sizes, shapes and colors, often with dark purple to brown borders.	Apply same fungicides as for Botrytis petal blight on same schedule. Seldom permanently damages tree.	
	Canker	A general lack of vigor. Leaves smaller and lighter green than normal, may dry and shrivel during dry periods. Caused by a canker at or near the soil level or on main roots.	Cankers can be cut out if they are not too large. Paint cut areas with tree paint. Cankers are associated with wounds. Avoid or treat wounds to aid in prevention.	
	Insects			
	Dogwood Borer	Larva white, feeds in bark for time then enters tree causing swollen area on trunk at or below ground surface. Adult clear wing moth. Overwinters as larva.	Wrap trunk of newly transplanted trees with heavy paper. If spray is used, apply to trunk in late May and again 3 weeks later.	lindane
ELM	Diseases			
	Anthracnose (fungus)	Irregular brown spots or areas between veins and margins.	Same as Ash anthracnose.	
	Black Leafspot (fungus)	Small, irregular spots that become shiny, tan-black and raised.	Same as Ash anthracnose.	
	Dutch Elm Disease (fungus)	Leaves wilt, turn yellow and brown in terminal parts of tree first; later entire tree. Brown discoloration occurs in sapwood just under bark in wilting branches. Positive identification requires laboratory culturing.	Cut and remove diseased trees. For protection of valuable trees, a program of annual spraying with insecticide and fungicide may have some value under certain circumstances. Therapy for infected trees is still questionable. Program should include:	Benlate

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
ELM (Cont.)	Diseases (Cont.)		(1) Vector control (insecticide) for bark beetles. (2) Control of root grafts. (3) Foliage spray with fungicide in spring at early full leaf. (4) Therapy through trunk or branch injections of Benomyl - gravity or pressure. Only by arborists trained in this technique.	methoxychlor SMDC (Vapam)
	Phloem Necrosis (mycoplasma)	During June and July, leaves roll upward, turn yellow or brown, wither and drop prematurely. Death of tree fairly quick. Inner bark, near trunk base, yellow to butterscotch-colored.	Infected trees cannot be cured. Use Vector control (insecticide) for leaf hoppers.	
	Wetwood (slime flux) (bacteria)	Dark-colored sap (flux) flows from branch stubs, split crotches, trunk cracks or other bark wounds.	Fertilize and water to stimulate vigor. Repair bark wounds promptly. Trees may need drain pipes installed to relieve internal pressure.	
	Insects			
	Smaller European Elm Bark Beetle	White, legless larvae overwinter in or under bark of recently killed and dying elm. Adults emerge in April and August. Vector for Dutch Elm Disease.	Spray high value elms and remove and destroy dead elms.	methoxychlor
	Elm Leaf Beetle	Adults overwinter. Approximately ¼ inch long, yellowish-green, dark stripes on wing covers. Larvae up to ½ inch long, dull yellow color with two black stripes, on elm leaves in June.	Check for larvae in early June. Spray when they are present. A second brood of larvae in late July.	carbaryl diazinon methoxychlor
	Spring Cankerworm	Caterpillars reddish to yellowish-brown, yellowish-green or blackish with yellow stripe just below the spiracles and a broad greenish-yellow stripe down the middle of the underside.	Check for larvae in mid- to late May. Spray when they are present.	Bacillus thuringiensis carbaryl methoxychlor Dibrom

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EUONYMUS	**Diseases**			
	Crown gall (bacteria)	Common and serious. Rounded galls with irregular rough surfaces on roots and stems.	Avoid wounding stems or roots. Prune out and burn affected plant parts. Dig up and burn severely affected plants.	
	Powdery Mildew (fungus)	White powdery, moldy patches on leaves.	Remove badly affected shoots. Prune to thin out. Spray with fungicide when mildew appears.	Actidione PM Benlate Karathane Wettable Sulfur
	Insects			
	Euonymus Scale	Small, yellow, soft bodied insects under shield-like scale on stems and leaves. Males under oblong white scale. Crawlers in late May and late July.	Prune and destroy heavily scale encrusted stems. Apply dormant oil in early spring. Other sprays are for crawler control.	superior dormant oil carbaryl malathion Zectran
FIR	**Diseases**			
	Needle Cast and Twig Blight	General and serious, especially on young trees. Brown specks or bands on needles. Needles have faded color, often from tip downward. Drop early.	Collect and remove fallen needles. Prune and remove dead twigs. Fertilize and water to maintain vigor. Spray with fungicide when new growth is ¼ emerged; repeat 2, 4, and 6 weeks later.	Benlate Bordeaux Mix Maneb
	Insects			
	Bagworms	See Arborvitae.		
	Pine Needle Scale	Overwinters as purplish eggs under grayish white oyster shell-like scales of needles.	Use dormant spray oil in early spring. Use other listed insecticides against crawlers in late May.	superior dormant oil diazinon carbaryl malathion Metasystox-R

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
HACKBERRY	**Diseases**			
	Powdery Mildew (fungus)	Powdery, white growth on both leaf surfaces.	When mildew appears, apply fungicide.	Actidione PM Benlate Karathane Wettable Sulfur
	Witches-broom (fungus)	Widespread. Unsightly clusters of dwarfed twigs. Twig dieback.	Cut off clusters back to healthy wood. Fertilize to stimulate vigorous growth. Dormant time -sulfur spray may be helpful.	
	Insects			
	Hackberry Nipple Gall (Psyllid)	Unsightly nipple-like growth on under surface of leaf. Grayish-black, jumping adults, emerge in September and in October, overwinter. Eggs on new stem growth and leaves in early May.	Treat in early May when leaves are 1 to 1.5 inches long.	carbaryl lindane malathion
HAWTHORN	**Diseases**			
	Cedar-Hawthorn Rust (fungus)	Widespread. Pale yellow-orange spots on leaves.	Same as Cedar-apple rust of Crab Apple.	
	Insects			
	Aphids	Some species under leaves. One species causes rosette of leaves. One species feed in clusters on branches.	Treat when needed.	malathion diazinon Dursban Dibrom
	Lace Bug	Small lacy-winged insects suck sap from underside of leaves. Sometimes cause leaf yellowing and premature leaf fall.	Treat when present - usually in late May.	lindane malathion carbaryl
	Scurfy Scale	Soft bodied insects under pear-shaped, dirty white shields. Male scale long, white. Over-winters as purplish under shield. One generation per year.	Use dormant oil in early spring. Other materials against crawlers in late May.	superior dormant oil malathion carbaryl

	Diseases			
	Anthracnose (fungus)	Round to irregular spots of various sizes on leaves. Many colors, from yellow to brown with brown to purplish margins.	Pick and remove spotted leaves, where practical. Spray with fungicide in late spring and continue at 10 to 14-day intervals.	Benlate Mancozeb
	Spine Spot (non-parasitic)	Small, grayish-brown to dark red punctures and scratches on both leaf surfaces in early spring.	Spots caused by wounding of leaves by spines of nearby leaves during windy conditions. Use anti-desiccants. Plant in sheltered locations or erect wind barriers.	
	Leaf Scorch (non-parasitic)	Irregular, scorched areas on leaves, especially near margins.	Same as for Spine Spot.	
	Winter Injury (non-parasitic)	Foliage brown and scorched. Twig dieback. Bark splitting.	Same as for Spine Spot.	
	Insects			
	Holly Leaf Miners	Puparia in larvae leaf-blotch mine, in spring. Small black fly about mid-May lays eggs in new leaves.	Use insecticide when adults are present, about mid-May.	diazinon Dylox
HONEY LOCUST	**Diseases**			
	Anthracnose and Leaf Blights (fungi)	General in wet seasons. Round to irregular spots and blotches on leaves and pods.	Collect and remove fallen leaves. Prune out dead twigs and weak wood to increase air circulation. If practical, spray with fungicide as buds begin to unfold and 10 and 20 days later. Use same materials as for Ash anthracnose.	
	Insects			
	Mimosa Webworm	Steel gray moth lays eggs in June. Dark greenish-black larvae web leaflets together. Browning of leaves in July. Serious browning by second generation larvae in August. Overwinters as pupa in protected places.	Check for first signs of foliage browning, usually July. Use sufficient spray pressure to drive spray into webbing.	carbaryl diazinon Di-Syston Dylox

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
HONEY LOCUST (Cont.)	Insects (Cont.)			
	Honey Locust Pod Gall	Developing leaflets become galls with white, legless maggots within. May be present any time new growth starts.	No insecticide labeled for use against the pest.	
	Leafhopper	Greenish, jumping insect that sucks sap resulting in leaf distortion and discoloration.	Apply spray when leafhoppers are present in damaging numbers.	carbaryl diazinon malathion Guthion Metasystox-R
IVY	Diseases			
	Leaf Spots (fungi) Twig Blight (fungi)	Small-to-large, round-to-irregular spots of various colors on leaves and stems.	Where practical pick and remove affected plant parts. Fungicide sprays usually not needed. Same materials as for Ash anthracnose may be used.	
	Insects			
	Leafhoppers	Several species of these small, green-reddish or brownish jumping insects, suck sap from the leaves.	Apply spray when leafhoppers are seen on plants.	methoxychlor Dursban Zectran
JUNIPER	Diseases			
	Phomopsis Needle and Twig Blight	See Arborvitae.	Same as Arborvitae.	
	Insects			
	Bagworm	See Arborvitae.		
	Juniper Tip Midge	Tips of twigs dry and turn brown. Tiny fly larvae inside tip cause the damage.	Spray about mid-May, June 20 and early August.	Cygon
	Juniper Webworm	Small, light brown larva, with parallel stripes on body, webs foliage together. Overwinters in the web. Feeds again in spring and matures about June 1.	Spray about May 1 and if needed in late September.	diazinon Dylox Sevimol
	Spider Mites	See Arborvitae.		

LILAC	Diseases			
	Powdery Mildew	General, unsightly, but not serious. Grayish-white mold patches on leaves from midsummer on. Especially in shaded areas.	Apply fungicide when mildew appears at 10-day intervals.	Benlate Karathane
	Shoot Blights (bacterial & fungal)	Common and severe in wet springs on shaded or crowded plants.	Prune annually for good air circulation. Prune out blighted portions. Disinfect tools. Avoid over-fertilization with nitrogenous materials. Control borers. When needed apply fungicide as leaves begin to unfold.	Bordeaux Fixed Copper
	Verticillium Wilt (fungus)	Leaves become pale, wilt and fall early, starting at base and spreading upward. Stems show brownish-green streaks under bark. Branch dieback.	Dig up and remove infected plants, roots and all. Avoid replanting in same spot for 5 - 6 years without drenching soil with soil fumigants.	
	Insects			
	Lilac Borer	White larvae with brown heads bore into larger stems near soil level. Adult a brownish wasp-like moth. In late May and June.	Treat large stems in late May or early June and again 3 weeks later.	lindane Thiodan
	Oyster Shell Scale	See Ash.		
LINDEN (Basswood)	Diseases			
	Anthracnose, Leaf Blotch, Leaf Spots (fungi)	General in wet seasons. Small to large, round to irregular light brown spots with darker margins.	Prune out and remove dead and infected plant parts. When serious, spray with fungicide as buds start to swell. Repeat two times at 10-day intervals.	Bordeaux mix. Fixed Copper.
	Powdery Mildew (fungus)	General. Powdery, grayish-white mold on leaves and young shoots.	Where serious, spray twice when mildew develops.	Benlate Wettable Sulfur

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
LINDEN (Cont.)	Insects			
	Fall Webworm	Woolly, grayish caterpillars in tentlike webs, usually toward tips of limbs, in June and August. Moth white with small scattered black spots.	Destroy by hand or if many webs, spray in June and in early August.	Bacillus thuringiensis methoxychlor malathion Dylox
	Scurfy Scale	See Hawthorn.		
	Yellow-necked caterpillar	See Birch.		
MAPLE	Diseases			
	Anthracnose, Tar Spot, Zonate Leaf Spot (fungi)	General in wet seasons. Small to large, round to irregular, light to reddish-brown areas on leaves. Small to large round, yellowish-gray or shiny black spots.	Same as Ash anthracnose.	
	Verticillium Wilt (fungus)	Very destructive. Leaves suddenly discolor and wilt on one or more limbs, usually in midsummer. Olive-green to brown streaks in sapwood.	Same as Catalpa-Verticillium wilt.	
	Maple Decline (cause undetermined)	Trees decline in vigor. Foliage thin and weak. Leaves turn yellow, wither and fall early.	Maintain vigor with fertilization in spring, watering during moisture stress. Other cultural measures to promote vigor.	
	Insects			
	Aphids	Plant lice feed on leaves.	Treat when numerous.	diazinon malathion Dursban Zectran
	Borers	Larvae bore into trunk at or near ground line.	Wrap trunks of young plants for two years after transplant with wrapping paper. Prevent mechanical injury. Spray lower trunk of unwrapped trees in late June.	lindane

MAPLE (Cont.)	Insects (Cont.)			
	Maple Bladder Gall Mite	These mites overwinter in bud scars and under bark. Move to developing leaves in spring and cause the green, red, and black blister-like leaf galls on the upper surface.	Apply spray when leaves are about half expanded. Seldom causes serious damage.	diazinon Zectran Dursban Superior dormant oil
	Cottony Maple Scale	Overwinter as nymphs under scale. Female matures and deposits mass of eggs. White "cotton" wax covers eggs. Yellow crawlers usually by early June.	Spray when crawlers are present.	carbaryl diazinon Zectran
	White-marked Tussock Moth	Caterpillars with coral-red heads and thoracic shields, brush-like tufts of whitish hairs on each of the first four abdominal segments and reddish dots on the sixth and seventh segments.	Spray in late May or early June or when larvae are first observed.	carbaryl diazinon malathion
MIMOSA	Diseases			
	Fusarium Wilt (fungus)	Leaves turn yellow, wilt, shrivel, and hang downward on one or more branches. Brown streaks under bark.	Cut and remove seriously affected trees. Wilt-resistant strains available.	
	Insects			
	Mimosa Webworm	See Honey Locust.		
MOUNTAIN ASH	Diseases			
	Fire Blight (bacteria)	General and serious. New shoots suddenly appear as if scorched by fire.	Follow directions for sanitation and chemical control recommended for fire blight of crab apple.	
	Cytospora Canker (fungus)	Most common on weakened or injured trees low in vigor. Irregular cankers often girdle twigs, limbs, or trunk, killing parts beyond.	Prune out and remove cankered parts in dry weather. Sterilize cuts with disinfectant. Use tree paint on wounds. Maintain vigor by fertilizing in spring. Where serious, spray with fungicide.	Benlate Bordeaux Mix
	Insects			
	Mites	See Arborvitae.		
	Woolly Apple Aphid	Blackish, soft-bodied aphids in white waxy mass covering. Appear on stem, branches and roots.	Thorough coverage is essential when aphids are noted.	malathion diazinon Dursban

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
OAK	Diseases			
	Anthracnose (fungus)	Small, scattered, brown spots along veins, giving leaves a scorched appearance. (Can be confused with non-parasitic leaf scorch.)	Collect and remove diseased leaves. In wet years it may be necessary to use a fungicide spray at time of early leaf break and twice thereafter at 10-day intervals.	Zineb Bordeaux Mix Kocide 101
	Taphrina Leaf Blister (fungus)	Yellow or brown, more or less round, raised blisters on upper leaf surface.	Collect and remove fallen leaves. Spray with fungicide before buds open.	Zineb Captan
	Oak Wilt (fungus)	All oaks susceptible. Leaves turn pale, progressively become more yellowed or bronzed from tips and margins inward. Wilting and dieback. Brown or black streaks in sapwood. Positive identification possible only by laboratory culturing.	Infected trees cannot be cured. Remove and burn all infected and dead oaks as soon as possible.	
	Chlorosis (iron deficiency) (non-parasitic disorder)	Pin and willow oaks susceptible in neutral or alkaline soils. Yellowish-green leaves with darker green veins.	Use 1 to 1 mixture of iron sulfate and sulfur when leaves are expanding. Or iron chelate. Follow manufacturer's directions.	
	Powdery Mildew (fungus)	Whitish, powdery mold on leaves. Leaves may be stunted, distorted, and drop early.	Collect and remove infected leaves. Spray generally not necessary.	Benlate Karathane
	Insects			
	Aphids	Many species feed on the leaves of oak. Some excrete much honeydew.	Spray when aphids are present.	malathion diazinon Dursban
	Galls	A great number of galls are present on oaks. They may appear on leaves, acorns, buds, twigs, roots, bark, and catkins.	If spray is applied, it should usually be applied in the spring when the leaves are about half expanded.	carbaryl malathion

OAK (Con(	nsects (Cont.)			
	Golden Oak Scale	Greenish-golden, circular, slightly convex scales in pits in bark of limbs.	A dormant spray using summer oil in early spring. Use other materials when crawlers are present. At least 2 applications 14 days apart.	summer oil carbaryl diazinon malathion Zectran
	Oak Kermes Scale	Spherical, gall-like scales 3/16 to 1/4 inch in diameter. Overwinter as partially grown nymphs on twigs.	Seldom warrant control. Apply dormant spray using summer oil in early spring. Other materials for crawlers in fall.	summer oil carbaryl diazinon malathion Zectran
	Obscure Scale	Overwinters as nymphs under circular, gray shields, on bark of limbs and trunk.	Dormant spray using summer oil in spring. Other materials against crawlers in late July.	summer oil carbaryl diazinon Zectran
	Twig Pruner	Adult a longhorn beetle. Larvae sever twigs and fall with them to ground for overwintering.	Collect severed twigs and destroy.	
	Pin Oak Sawfly	Full-grown larvae are slug-like, yellowish-green, 1/2 inch long. Skeletonize leaves.	Spray in late May or early September or as soon as skeletonized leaves are observed.	carbaryl diazinon malathion
PINE	Diseases			
	Tip Blight and Needle Cast (fungi)	General and serious. Needles turn olive green, yellow or brown. Drop prematurely. Lower branches usually affected first. Trees may be killed.	Collect and remove diseased twigs and needles in fall. Spray with fungicide-- Tip Blight: (1) as new growth starts, (2) as needles emerge from sheath, and (3) when needles are 2/3 of mature length. Needle Cast: (1) week of May 20 and (2) week of June 28.	Benlate (needle cast only Bordeaux Mix Maneb copper resin
	Winter Injury (non-parasitic)	Last year's needles turn yellow to reddish-brown and die from tip down. Needles often fall in late spring or summer.	Water trees in late fall especially following drought. Mulch to prevent deep freezing and thawing around roots.	
	Fall Browning	Needles inside the tree turn yellow then brown. More concentrated in some years than others.	Normal shedding of needles.	

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
PINE (Cont.)	Insects			
	Bagworm	See Arborvitae.		
	European Pine Shoot Moth	Adult a rust-red and gray moth. Small larvae overwinter in buds or under pitch. Pupate in late spring.	Treat terminals in mid-April and in mid-July.	diazinon malathion Zectran
	Pine Bark Aphid	Aphid overwinters as adult female under white wax flakes on trunk of tree. Young appear in late April or early May. Several generations during season.	Dormant oil in spring, other material as needed.	superior dormant oil lindane malathion diazinon Zectran Dursban
	Pine Needle Scale	See Fir.		
	Sawflies	There are several species of sawflies that feed on the needles of pine. Larvae of most species present from mid-May to early June.	Spray when larvae are present.	Sevimol Zectran
	Zimmerman Pine Moth	Excessive masses of resin on branches and terminals. Adult reddish with waxy white lines. Larvae overwinter in resin masses.	Spray for larval control in mid-April and early September.	lindane Dylox Zectran
PLUM (ornamental)	Diseases			
	Black Knot (fungus)	Widespread. Elongated, rough black swellings on twigs, small branches and sometimes on trunk.	Prune and destroy all infected wood in late winter, making cuts at least 4 - 6 inches below infected area. Apply tree paint to wounds. Apply dormant fungicide spray.	Beniate Bordeaux Mix Ferbam
	Plum Pockets (fungus)	General following cool rainy spring. Unfolding leaves are curled, swollen, yellow reddish or purplish and leathery. Fruit infections also.	Apply single dormant spray before buds swell in late winter or early spring.	Bordeaux Mix Ferbam Dichlone

PLUM (Cont.) (ornamental)	Insects			
	Scales	See Hawthorn.		
	Leafhoppers	See Crab Apples.		
POPLAR	Diseases			
	Cytospora Canker (fungus)	General and serious. Irregular, rough, discolored, often sunken and cracked cankers on twigs, branches and trunk. Girdled parts die.	Avoid wounding. If practical, prune out cankers on small branches. Treat pruning wounds with tree paint. Water and fertilize to maintain vigor. Control insects.	
	Insects			
	Oyster Shell Scale	See Ash.		
	Leaf Beetles	Grayish-black larvae skeletonize leaves. Beetles gray with black dashes on wing covers, or red with black marks.	Sometimes numerous enough to warrant control.	carbaryl Zectran malathion
PRIVET	Diseases			
	Anthracnose (fungus)	Leaves turn pale green, wilt, shrivel and cling to stem.	Cut and remove infected parts. Apply fungicide spray in wet weather. See anthracnose of Ash.	
	Insects			
	Lilac Borer	See Lilac.		
	Privet Thrips	Tiny black and white banded thrips on leaves, cause leaf browning.	Treat when thrips are noted.	carbaryl diazinon malathion
PYRACANTHA (Fire thorn)	Diseases			
	Fire Blight (bacteria)	General and serious. New shoots appear as if scorched by fire. Leaves cling to twigs.	See control measures under Crab Apple.	

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
PYRACANTHA (Cont.)	Diseases (Cont.)			
	Scab (fungus)	Serious in wet seasons. Spots occur on leaves, and fruit turns brown instead of bright orange.	Cut out and remove infected parts. Use fungicide spray, starting early in spring at bud break and 10 to 14 days later at petal fall.	Benlate
	Insects			
	Lace Bug	See Hawthorn.		
	Leaf Crumpler	Dark brown, slightly hairy caterpillars, 1/3 to ½ inch long in tough, curled, cases. Spend winter on host. Pupae late May, moths in June.	Spray in late April	diazinon malathion Zectran
REDBUD	Diseases			
	Botryosphaeria Twig Blight	Twigs die back. Discolored, sunken areas on twigs.	Severely cankered parts should be pruned and destroyed. Sterilize pruning tools between cuts.	
	Insects			
	(Usually no serious insect problems.)			
ROSE	Diseases			
	Black Spot (fungus)	General and serious. Roundish black spots with irregular margins on leaves.	Collect and remove fallen leaves. Start applying fungicide sprays in spring as leaves expand. 10-day intervals.	Benlate Daconil Mancozeb Folpet
	Crown Gall (bacteria)	Small to large hard, rough galls on roots, crown and canes.	Use certified, disease-free stock. Carefully remove and destroy infected plant parts. Avoid wounding. Strict sanitation measures.	

ROSE (Cont.)	Diseases (Cont.)			
	Cankers of Canes (fungus)	Girdling cankers on canes.	Control black spot. Prune out diseased and dead canes.	
	Powdery Mildew	Whitish patches on leaves.	Start fungicide applications in spring as leaves expand, at 10 - 14 day intervals.	Actidione PM Benlate Karathane
	Insects			
	Aphids	See Hawthorn.		
	Leafhoppers	See Hawthorn.		
	Leafrollers	Several species may be present. Larvae, usually greenhish and very active. Roll leaves and feed from the roll. Adults are small moths.	Use spray when larvae are present and still small.	diazinon malathion methoxychlor
	Rose Scale	Female scales almost circular, 1/8 inch diameter. White, male scale long and narrow, ridged. Overwinter as egg. Crawlers late May and June.	See Scurfy Scale under Hawthorn.	
	Spider Mite	See Arborvitae.		
	Slug	See Oak, pin oak sawfly.		
SNOWBALL (Viburnum)	Diseases			
	Anthracnose (spot) Leaf Spots (fungi)	Spots of various sizes, shapes and colors.	If necessary, spray weekly with fungicide. See Ash anthracnose.	
	Powdery Mildew (fungus)	White powdery mold on leaves in late summer and fall.	Use fungicide treatment specific for powdery mildew under Rose.	
	Insects			
	Aphid	Small, soft, ash-gray to dark green insects with piercing sucking mouth-parts. Feed on leaves and cause leaves to cup and roll.	Apply sprays in spring when aphids start to roll leaves. Generally does not cause serious damage to plant.	malathion diazinon Dibrom Dursban

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
SPIREA	Diseases			
	Fire Blight (bacteria)	Blossoms blackened. Shoots die back from tip. Dead leaves cling to shoots.	See under Crab Apple.	
	Leaf Spots (fungi)	Various shapes, sizes and colors.	See control of Ash anthracnose.	
	Powdery Mildew (fungus)	Especially in humid, wet weather. White powdery mold on young leaves and shoots. Distorted flowers.	See fungicide treatment for powdery mildew under Rose.	
	Insects			
	Aphid	See Snowball.		
	Leafrollers	See Rose.		
SPRUCE	Diseases			
	Cytospora Canker (fungus)	Widespread and serious, especially on Blue, Colorado and Norway species. Tufts of needles at branch tips turn light gray or brown and die first. Bluish-white resin exudes from bark of drying branches.	Promptly cut out and destroy dying branches and two apparently healthy ones just above, back to trunk or nearest healthy lateral branch. Do not prune in wet weather. Disinfect pruning tools. In addition, spray with fungicide before new growth starts, and repeat 4 - 5 times at 10 - 14-day intervals. Coverage of low branches is very important.	Bordeaux Mix Benlate
	Insects			
	Bagworm	See Arborvitae.		
	Pine Needle Scale	See Fir.		

SPRU(●ont.)	Insects (Cont.)			
	Spruce Needle Miner	Needles mined, dead and webbed together in masses close to twigs. Overwinter as small larvae in mined needles. Moths grayish, in June.	Spray when larvae are present and small, usually late June.	Sevimol diazinon
	Spider Mite	See Arborvitae.		
SWEET GUM	Diseases			
	Bleeding Necrosis	Trees "bleed" from bark surface. Resembles oil on bark of trunk and larger branches. Branches die and trees usually die once affected.	Destroy affected trees.	
	Sweet Gum Blight	Leaves dwarfed and fall early. Foliage is thin.	Maintain fertility levels.	
	Insects			
	Leaf Tier	Leaves webbed together and partially skeletonized by yellowish-green larvae.	Spray in June when larvae are present.	Dylox Sevimol
	Pit Forming Scale	Small, soft, yellow insect under shield-like scale on leaves, branches and buds.	Use dormant oil in early spring. Use other insecticides against crawlers on leaves. Usually mid-June and September.	Superior dormant oil carbaryl Zectran
SYCAMORE	Diseases			
	Anthracnose (fungi)	Serious in wet seasons. First symptoms on young leaves may be mistaken for frost injury. Later light brown spots occur along veins and enlarge to kill entire leaves. Tips of twigs may be killed back.	All fallen leaves and twigs should be removed. Spray as buds begin to swell. In rainy springs two additional sprays may be needed. One when the leaves are half grown, the other two weeks later.	Benlate Bordeaux Mix Kocide 101 Zineb copper resin
	Cankerstain (fungi)	Primarily on London Plane Tree. Small cankers with longitudinal cracks and roughened bark on trunk and large limbs. Bluish-black or brown discoloration under bark over the cankers. There is a gradual thinning of leaves as disease progresses.	Disease is spread primarily by pruning tools. Disinfect tools. No control for disease once it is infected.	

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
SYCAMORE (Cont.)	Insects			
	Sycamore Lace Bug	See Hawthorn (Hawthorn Lace Bug).		
TULIP TREE	Diseases			
	Cankers (fungi)	Sunken areas on twigs and branches causes death of end of branch.	Prune and remove infected parts.	
	Leat Spots (fungi)	Many fungi cause leat spots on Tulip Tree.	Removing fallen leaves will generally give satisfactory control.	
	Leaf Yellowing (non-parasitic)	Serious on young trees. Leaves throughout crown turn yellow and drop prematurely.	Response to drought, deep watering will generally correct the condition.	
	Insects			
	Aphid	Small, soft bodied aphids on leaves. Excrete much honeydew.	Treat when aphids are present.	malathion lindane Baytex Dursban
	Tulip Tree Scale	Large, brown, hemispherical scale up to ½ inch in diameter covers soft bodied insect on twigs. Overwinter as immature scales. Young in August.	Use dormant oil in spring. Other materials to control crawlers in August.	Superior dormant oil carbaryl Zectran
WILLOW	Diseases			
	Cankers (fungus)	Widespread and serious. Discolored, sunken areas on twigs, branches or trunk. Cause girdling and death of parts.	Cut and remove dead and cankered parts. Use additional measures as suggested under canker of Poplar.	
	Crown Gall (bacteria)	Rough, irregular, overgrowth on roots, branches or trunk, usually near ground line.	Galls on larger trees may be removed surgically, and a wound paint applied to wound. Disinfect tools between cuts. Remove galls during late fall or midsummer when sap flow is minimal.	

WILLOW (Cont.)	Diseases (Cont.)			
	Leaf Spots, Spot Anthracnose (fungi)	Widespread, but not serious. Small to large round to irregular brown spots on leaves.	Collect and remove fallen leaves. Spray usually not necessary.	
	Insects			
	Aphids	Several species of soft bodied insects suck sap from leaves and trunk.	Treat when aphids are present.	malathion lindane diazinon Dursban
	Leaf Beetles	See Poplar.		
	Oyster Shell Scale	See Lilac.		
	Scurfy Scale	See Hawthorn.		
YEW	Diseases			
	Phytophthora Root and Crown Root (fungus)	Plants usually slowly decline in vigor and die. Brown-colored cortical tissues in the root and crown areas. Often associated with "wet feet."	Maintain good drainage and vigor.	
	Wet Feet (non-parasitic)	Plants turn yellow and brown. Whole plant may die rather rapidly. Usually occurs in spots where moisture has been excessive. Can be complicated by root and crown diseases.	Maintain good drainage. Plant yews in spots that do not get overly wet.	
	Winter Injury (non-parasitic)	Small twigs at end of branches turn yellow to reddish-brown in late winter or early spring, especially on south and southwest sides where plants are exposed. Tips of needles appear scorched.	Shake off heavy snow or ice loads promptly. Protect from drying winter winds and sun. Grow in protected locations. Apply mulches in late fall.	
	Insects			
	Fletchers Scale	Yellowish-brown to reddish hemispherical scale over soft bodied insects. Eggs in June. Crawlers June and July.	Spray with dormant oil in spring. Other materials for crawlers when present.	Superior dormant oil carbaryl malathion Zectran Cygon

PLANT	PROBLEM	DESCRIPTION	CONTROL	
			Remarks	Pesticide
YEW (Cont.)	Insects (Cont.)			
	Mealybug	Soft bodied, blackish, sucking insect with white waxy covering on twigs and stem.	Use dormant oil in spring. Other materials in late May and late July. Thorough spray coverage is essential.	superior dormant oil malathion Dursban Zectran
		LAWN INSECT PESTS		
	Ants	Several species of ground nesting ants dig holes in lawns. Their mounds detract from the beauty of the lawn.	Apply controls when ants are present.	diazinon Dursban carbaryl
	Billbugs	Adults gray to black snout beetles. Larvae (grubs), white, feed on the roots and stems of grass.	Treat the infested lawn May 15-20 the year following the first observation of larval feeding.	Dursban diazinon
	Chiggers and Clover Mites	These mite pests do not damage lawns but annoy people--chiggers by attacking people and clover mites by invading homes. Heavy infestations are most likely to occur in tall, unmowed grass, vacant lots and other unkempt areas.	Apply control for chiggers as soon as a problem develops. Clover mite control should be applied in September as the pests are migrating to homes.	Kelthane diazinon malathion
	Chinch Bugs	Bugs about 1/16 inch long, black with white markings. Immatures red with white band, then black with white spots.	Spray when insects are present.	carbaryl diazinon Dursban
	Cutworms and Armyworms	Several species. Caterpillars dull brown, gray or black, spotted or striped. Adults are moths. Feed on grass stems and leaves.	Apply spray when caterpillars are present.	diazinon carbaryl Dursban

LAWN INSECT PESTS (Cont.)

Digger Wasps	Disfigure lawns by digging holes in the soil as entrances to underground nests. Digger wasps usually do not attack people or pets unless they are annoyed.	Apply control at dusk to nest entrances and directly into the burrow.	diazinon lindane carbaryl Vapona malathion
Earthworms	"Castings" cause lumpy areas on the lawn.	Chemical control is not recommended as earthworms are beneficial organisms. Rolling the lawn with a weighted roller in the spring when the ground is moist will reduce the "lumpiness" of the lawn for 2 to 3 years.	
Leafhoppers	Many species of black, green, gray or mottled, jumping insects that suck sap from the plants.	Spray when insects are present.	carbaryl diazinon malathion
Sod Webworms	Adults are light brown to whitish moths. Larvae dark greenish. Feed on leaves and stems of grass. Overwinter as partially grown larvae.	Spray approximately 2 weeks after a sharp decline in the moth population or as soon as damage is observed.	carbaryl diazinon Dursban Dylox
White Grubs	Adults, May beetles. White, crescent-shaped, brown-headed larvae feed on roots of grass.	Make soil application during late July or August.	Dylox diazinon Dursban

TURF DISEASES

Many turf diseases can be prevented by growing adapted, resistant varieties of grass. In addition, providing for good water drainage, maintaining proper vigor through a fertilization program based on a soil test, mowing properly, removing clippings and implementing other cultural practices will help to reduce the susceptibility and impact of many turf diseases.

Problem	Description	Control	
		Remarks	Pesticide
Brown patch	Bentgrass (closely cut): Circular, light brown patches, up to 3 feet across. A grayish-black ring may border spots in early morning. Other grasses: round, light brown patches, up to many feet across. Turf thinned or killed when underground parts rot.	Apply sprays June to August, 7-14 days as required.	*Acti-dione-Thiram W Captan 50W Daconil 2787 75W Dyrene 50W Fore 80W Fungo 50W Kromad W Mertect 140F Tersan LSR 80W Tersan 1991 50W Tobaz W
Dollar spot	Bentgrass (closely cut): round, straw-colored spots, 1 to 3 inches in diameter. Other grasses: straw-colored spots up to 6 inches or more across. Light tan, girdling leaf spots with reddish-brown border. If unchecked, large irregular, dead, sunken areas may develop.	Apply sprays June to August, 7-14 days as required.	*Acti-dione-Thiram W Daconil 2787 75W Dyrene 50W Fore 80W Fungo 50W Kromad W Mertect 140F Tersan 1991 50W Tobaz W
Fairy ring	Enlarging circles, arcs or tufts of dark green, fast-growing grass, inside or outside. most rings are 3 to 15 feet across; may be 50 feet or more. Mushrooms suddenly appear in the rings from spring to fall following rains or heavy watering. Rings often invaded later by weeds.	Chemical control is not recommended. Mask rings by fertilizing with nitrogen several times a year and pumping large quantities of water to depth of 10 to 24 inches into the rings using a tree-feeding lance or root-feeder attachment on hose. Repeat when rings begin to wilt.	

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*Acti-dione-Thiram - May be phytotoxic and cause injury if used at high temperatures in excess of recommended rates.

Problem	Description	Control: Remarks	Control: Pesticide
Mushrooms and Puffballs	Grow on decaying organic matter in soil. Common around dead and buried stumps, dead roots, logs, boards, or a thick thatch. Occur following heavy rains or watering. Some are foul-smelling; a few are poisonous.	Chemical control is not recommended. If practical, dig up and destroy rotting wood or other debris; or break and mow off the mushrooms and puffballs. They disappear naturally when the "food base" is exhausted, but this may take years.	
Pythium blight (grease spot, spot blight, cottony blight)	Small, irregular, water-soaked "greasy" patches, up to 6 inches in diameter. Spots fade to light tan as grass dries. Spots may join to form irregular areas or elongate streaks. Straw-colored lesions, without conspicuous borders, form on grass blades; cause them to twist, collapse, and die. Fluffy white mold covers blighted grass when air is moisture-saturated.	Apply sprays when temperatures are above 80°F and the relative humidity is high.	Koban Tersan SP
Powdery mildew	Superficial, white to grayish-white, powdery patches on leaves. Leaves may turn yellow and die. Turf appears dull white; may be thinned and killed. Most serious on new planting.	Apply sprays during spring or fall as required Apply according to label directions.	Fungo 50W Sulfur W
Rust	Oval to elongated, yellow to orange, reddish-to chestnut-brown or black dusty pustules on leaves and sheaths. Heavily infected grass appears yellow, thin, weak, and more susceptible to drouth, winter-kill, etc.	Apply sprays July to September 7-14 days as required.	*Acti-dione-Thiram W Daconil 2787 75W Dyrene 50W Fore 80W Tersan LSR 80W Zineb 75W

*Acti-dione-Thiram - May be phytotoxic and cause injury if used at high temperatures in excess of recommended rates.

Problem	Description	Control: Remarks	Control: Pesticide
Fusarium blight	Scattered, light green patches, 2 to 6 inches across, that soon enlarge, turn tan, and finally turn straw-colored. Most common in midsummer as circles, streaks, or crescents, up to about 2 feet across, with grass that appears to be healthy in the center ("frogeyes").	Apply sprays in June to August as required.	Tersan 1991 50W Cleary's 3336 50W Fungo 50W
Fusarium patch (pink snow mold)	Round, bleached-tan, whitish-gray or reddish-brown spots, 1 to 12 inches or more across. A dense, white to pink mold covers diseased turf in wet weather; quickly disappears as grass dries.	Apply sprays in November or December before heavy snowfall. Reapply one or more times in winter or spring as snow melts.	Ortho Lawn and Turf Fungicide Tersan 1991 Daconil 2787 Fore Mertect Tobaz
Leaf smut (stripe, smut, flag smut)	Individual plants of patches are stunted with dull gray streaks in leaves and sheaths. Streaks rupture to expose dusty, black masses of smut spores. Leaves split and shred, twist, curl, and die. Weed invasion soon follows.	Apply 2 applications, spring or fall. Apply 1 application, spring or October.	Fungo 50W Tersan 1991 50W
Leaf spot (melting out)	Round to elongate, dark brown or reddish-brown to purplish-black spots on leaves, sheaths, and stems. Spots enlarge and develop gray or tan centers, often with prominent dark margins. Leaves turn yellow, then brown, wither, and die. Turf vigor is reduced; grass thins out in scattered areas with a general brownish or reddish cast. Large, irregular areas may die in hot weather as crown and roots decay and turn reddish-brown to blac	Apply sprays April to June every 7-14 days.	Captan 50W Daconil 2787 75W Dyrene 50W Fore 80W Tersan LSR 80W

Problem	Description	Control	
		Remarks	Pesticide
Slime mold	Slimy or greasy masses, which can be watery white, cream to yellow, or gray, suddenly appear on grass in round to irregular patches a foot or more across. Masses dry to bluish, gray-white, black or cream-yellow powdery structures, which are easily wiped off; grass blades underneath are healthy.	No control is necessary. Slime molds are noninfectious and harmless; only use grass as a means of support. If desirable, mow, rake, brush or pole affected areas, or hose down with water.	
Snow mold (gray snow mold	Roughly circular, dead, straw-colored areas up to 2 feet or more across; may merge to kill large, irregular areas. Usually found where snow is melting. Wet grass may be covered with fluffy white to bluish-gray mold or a silvery, membranous crust that quickly disappears as grass dries.	Apply sprays in November or December before heavy snowfall. Reapply one or more times in winter or spring as snow melts.	Thiram WP 75 Cadminate Ortho Lawn & Turf Fertilizer Tersan SP

North Central Regional
Extension Publication No. 26

Lawn Weeds and their Control

Cooperative Extension Service, Iowa State University of Science and Technology and the United States Department of Agriculture cooperating. Charles E. Donhowe, director, Ames, Iowa. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

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Issued March 1970, 32,000
Revised June 1970, 5,000
Reprinted May 1971, 18,000
Reprinted April 1973, 18,100
Revised February 1975, 27,750
Reprinted May 1976, 26,700

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ACKNOWLEDGMENTS

This bulletin was prepared as a Regional Publication by authorization of the North Central Agricultural Extension Services. The publication is an adaptation and expansion of Nebraska Extension Circular 68–178 *Lawn Weeds and Their Control* by John D. Furrer.

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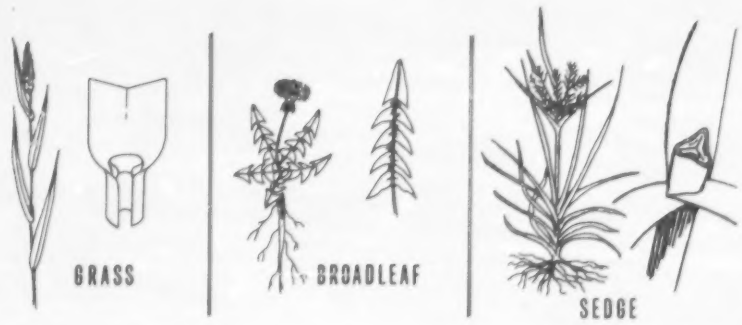
Suggestions, advice, and special assistance were rendered by weed scientists and turf specialists from the North Central Region.

Control recommendations are based on research results in the North Central Region, USDA recommendations, and label registrations. Suggestions are designed to benefit when control programs are needed. Recommendations are subject to withdrawal or change at any time. In some instances, trade names have been used to simplify recommendations. No endorsement is implied and no discrimination is intended.

Lawn Weeds and Their Control

Homeowners with well-kept lawns often spend three to five dollars per 1,000 square feet for weed control. Correct identification, selection of the right herbicide (weed killer) and proper application are essential for the successful control of weeds. Knowledge of plant characteristics and growth habits is helpful with both identification and control.



Grasses, Broadleaves, and Sedges

There are three basic kinds of weeds: Grasses, broadleaves and sedges.

True *grasses* have jointed hollow stems; the leaf blades have parallel veins and are several times longer than they are wide; the root systems are fibrous; most seed heads are similar to small grain. Foxtail and quackgrass are typical grasses.

Broadleaf weeds often have showy flowers; the leaves have a network of small veins originating from a principal vein which divides the leaf in half; a strong main root called a taproot is usually present. Dandelion and knotweed are typical broadleaf species.

Sedges are grass-like plants with three-cornered stems which bear leaves extending in three directions. They are neither true grasses nor true broadleaves. Yellow nutsedge is an example.

Annuals, Biennials, Perennials

Several additional groupings could be made but from a control standpoint, determination of life span—annual, biennial or perennial—is most important.

An *annual* germinates from seed, grows, matures, and dies in less than 12 months or when killed by frost. Crabgrass, foxtail and prostrate knotweed are examples of annuals. Many annual weeds are effectively controlled with preemergence herbicides (chemicals applied to the soil to stop growth from seed). After weeds appear, postemergence herbicides (applied to the growing plant after emergence) work most effectively if used about 30 days after emergence.

A winter annual starts its life cycle in the fall and completes it the next spring. Henbit and shepherdspurse are winter annuals. Herbicides for their control are applied in the fall or early spring.

Biennials require two years to complete their life cycle. They form a rosette and store food in their fleshy root the first year and flower the second year. Many thistles are biennials. Control measures are most effective when applied during the first year's growth. If treatment is delayed until the second year, early season application of herbicide before bloom is important.

Perennials live more than two years. Field bindweed and white clover are typical perennials. Chemical control of perennials works best when applied to actively growing and well developed foliage about 30 to 40 days after spring growth begins. Late fall is a good time to treat perennials that resume growth after summer dormancy.

Cool Season—Warm Season

Cool season plants grow best during cool periods and mature or go dormant during the hottest part of the summer. Bluegrass and dandelions are cool season perennials. Winter annuals also are cool season plants.

Timely chemical control for cool season species coincides with periods of active growth in fall and early spring. Preemergence weed killers for the control of cool season annuals that germinate in the spring (knotweed for example) must be applied before March 15 in the southern part of the region and April 15 in the northern part.

Plants that remain dormant vegetatively or as seed that does not germinate until temperatures warm up in May and June are known as *warm season* plants. Crab grass, foxtail and prostrate spurge are typical warm season annuals. Germination of warm season annuals occurs approximately April 15 in the south and May 15 in the north. This gives additional time for application of preemergence chemicals.

Warm season perennial grasses such as nimblewill present objectionable appearances in cool season lawns. They remain dormant and brown in the spring 45 or more days longer than bluegrass. In the fall, warm season species turn brown after the first frost; cool season grasses usually remain green an extra 30 days or more.

Identification Aids

Comparison of a weed with a picture is the easiest way to identify an unknown. Note the distinctive characteristics listed for each species. Observe the growth habits. Does the plant grow upright or prostrate? Is the stem fleshy? Does it contain milky sap? Does it root at the nodes (joints)? Does it have a square stem? Note whether a plant is annual, biennial, or perennial; cool season or warm season.

For example, a green weedy grass found in early spring is not crabgrass, foxtail, or nimblewill since they do not start growth that early.

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Barnyardgrass (Echinochloa crusgalli L.)

A coarse warm season annual grass with a flattened stem especially near the base. Lower portion of the plant tends to be reddish purple. The seed head branches into 6 or 8 short compact segments.

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Barnyardgrass

Bluegrass, annual (Poa annua L.)

A low-growing, compact, tufted winter annual. Some flattened stems may lie close to the ground. It does not have rhizomes. Leaves are soft, light-green and boat-shaped at the tip. Starts growth from seed in early fall and often grows throughout winter. Can produce seed heads when mowed at 1/4". May die suddenly during summer months.

Other names: Poa annua.

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Annual Bluegrass

Brome, smooth (Bromus inermis Leyss.)

A cool season perennial. Many bluegrass lawns that contain smooth brome were started with pasture sod. The leaves are 3/8 to 1/2 inch wide and tend to be lax rather than upright. Close examination of an entire leaf will reveal an "M" or "W" across the leaf blade. The lower portion of the stem is almost white with prominent veins. Smooth brome spreads primarily by underground stems called rhizomes.

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Smooth Brome

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Crabgrass

Crabgrass (Digitaria spp.)

Crabgrass is one of the most common warm season annual grassy weeds. The stems grow mostly prostrate, branch freely and send down roots where each joint comes into contact with the soil or moist grass. Seed head is divided into several fingerlike segments. Two principal species are (1) large crabgrass (Digitaria sanguinalis L.) sometimes known as hairy crabgrass and (2) smooth crabgrass (Digitaria ischaemum Schreb.) Smooth crabgrass tends to be smaller, less hairy, and has purplish color on the stems.

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Tall Fescue

Fescue, tall (Festuca arundinacea Schreb.)

A very coarse cool season perennial bunch grass. Scattered clumps objectionable in fine textured turf grasses. Leaf veins are strongly fibrous. When mowed, fibers show on the cut edge, especially if mowers are not well sharpened. Mature leaf blades may be one-half inch wide, ribbed above and shiny smooth below. The lower portions of the stems are reddish purple, particularly in the spring and fall.

A similar grass, meadow fescue, (Festuca elatior L.) also is a frequent weed in bluegrass lawns.

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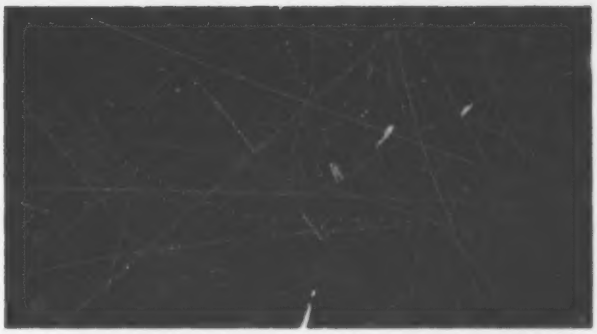
Foxtail

Foxtail (Setaria spp.)

Foxtails are warm season annuals. Yellow foxtail (Setaria glauca L.) has flattened stems that are often reddish colored on the lower portion. The stems of green foxtail (Setaria viridis L.) are round. The seed of yellow foxtail is four times as large as green foxtail. Giant foxtail (Setaria faberili) may be found in some lawns.

Goosegrass (Eleusine indica L.)

A decidedly warm season annual most often found growing where bluegrass stands are thin. Germinates later than crabgrass. The stems tend to be flattened and near the base are whitish in color. Flower heads are thicker and more robust than on common crabgrass. The extensive fibrous root system makes it difficult to pull.



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Goosegrass

Nimblewill (Muhlenbergia schreberi J. F.)

A warm season perennial grass. The wiry fine stems root at the nodes; root system is shallow and fibrous; forms circular patches or may be distributed throughout lawn. Objectionable in bluegrass lawns because of delayed spring growth and early dormancy in the fall.

Left: Conspicuous patches of dormant nimblewill scattered throughout Kentucky bluegrass.

Right: Close-up of nimblewill.

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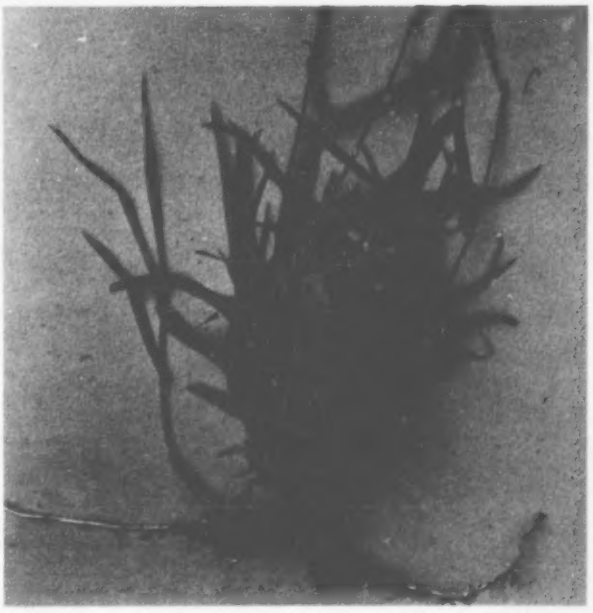
Nimblewill

Quackgrass (Agropyron repens L.)

A cool season perennial wheatgrass that spreads extensively by long white rhizomes (underground stems). Leaf blades are twice the width of bluegrass and tend to be rough in texture. A claw-like protrusion of the leaf called an auricle clasps the stem. One of the most distinguishing characteristics is a ring of root hairs every ¾ to 1 inch along the rhizomes. The lower leaf sheath of the stem is hairy.

Other common names: Couchgrass.



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Quackgrass

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Sandbur

Sandbur (Cenchrus spp.)

A warm season annual grass most often found in sandy turf areas that have been on low maintenance programs. Stems are flattened and branched; may be confused with yellow foxtail before formation of the spiny burs.

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Yellow Nutsedge

Nutsedge, yellow (Cyperus esculentus L.)

Warm-season perennial. Triangular stems of sedges produce 3-ranked leaves from near the ground. Leaves light yellow-green and rather harsh. Lower portion of plant is fibrous and brown. Roots often terminate with small nutlets, about the size of a kernel of popcorn. Seed heads appear burlike. Plants grow rapidly in July and August. Several species of sedge are common to our region but this one is most prevalent in lawns.

Uni. of Nebraska

Bedstraw

Bedstraw (Galium spp.)

Cool season plants, generally annuals, most often found in the dense shade of trees and shrubs. The leaves and leaflike parts (stipules) form whorls at distinct intervals along the weak stems. The square stems have tiny saw-toothed appendages which cause plants to stick together and to clothing. The flowers are small with four white petals.

Other names: Cleavers.

Bellflower, creeping (Campanula rapunculoides L.)

An escape from cultivation that can become a troublesome weed in lawns. The nodding, bell-shaped flowers are showy, ranging from a deep blue to purple. Creeping bellflower is a cool-season perennial with a root system that is both fleshy and fibrous. The basal leaves are heart-shaped with long stems. The leaves on the flower stalks are long and narrow without stems.

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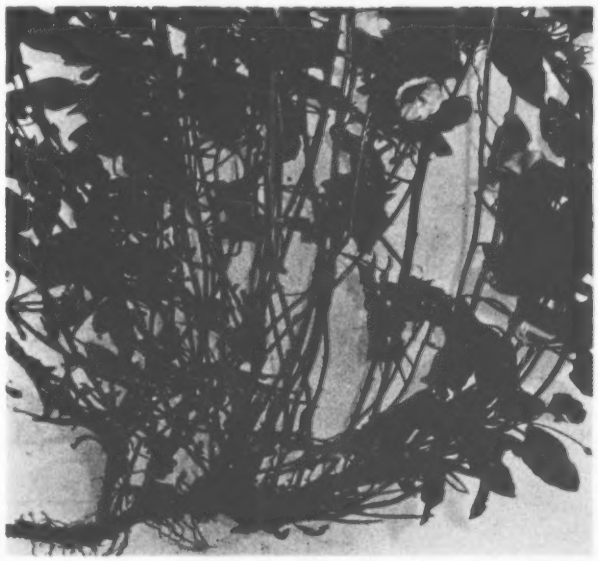
Creeping Bellflower

Bindweed, field (Convolvulus arvensis L.)

A deep rooted perennial vine common throughout most of the region. It is one of the more difficult weeds to control. The spade-shaped leaves have rounded tips and vary in size. The funnel shaped flowers vary from white to light pink and are about the size of a nickel. The plant readily climbs over shrubs and other ornamentals. It spreads by both seed and roots.

Other common names: Creeping jenny; perennial morning glory.



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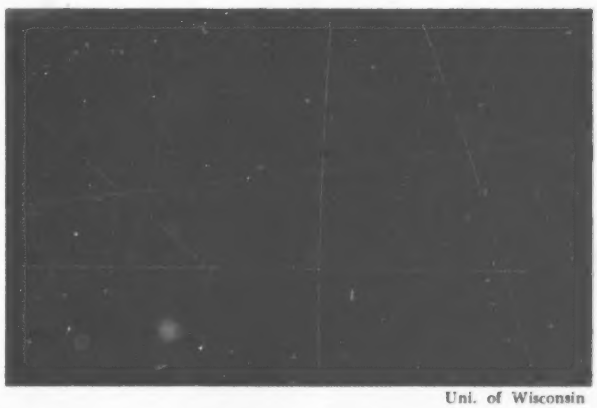
Field Bindweed

Carpetweed (Mollugo verticillata L.)

A late-starting, rapidly growing summer annual. The green, smooth stems branch along the ground in all directions from the root forming a flat circular mat on the soil surface. The light-green, smooth, tongue-like leaves are grouped five to six together forming whorls at each joint on the stem. Flowers are small, white, with several at each joint.



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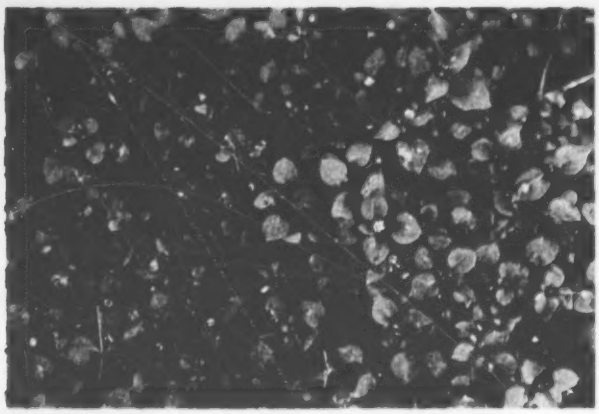
Carpetweed



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Common Chickweed

Chickweed, common (Stellaria media L.)

A hardy, low growing annual or winter annual with creeping stems that root at the nodes. It has a delicate appearance and is found in green form most of the year in milder climates. The small opposite leaves are oval-shaped and smooth. The small star-like flowers are white. Common chickweed is most often found in the shade of trees and shrubs and especially on the north side of buildings.

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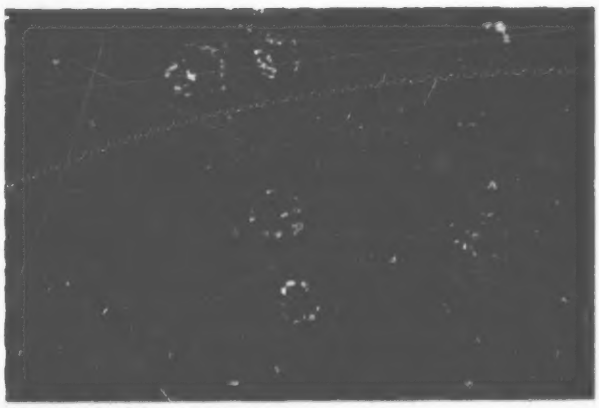
Mouseear Chickweed

Chickweed, mouseear (Cerastium vulgatum L.)

A perennial with creeping stems that root at the nodes. The leaves are opposite, 2-3 times longer than wide, clammy, and hairy. Flowers have five white petals. The root system is shallow and fibrous.



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White Clover

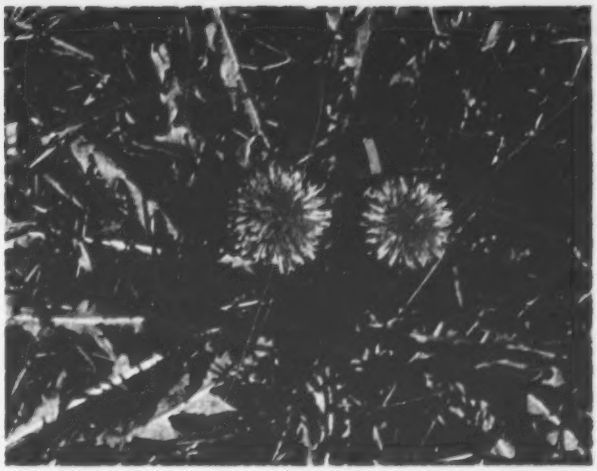
Clover, white (Trifolium repens L.)

A cool season perennial legume that spreads by underground and above ground stems. May or may not be objectionable in lawns, depending on individual preference. Flowers white, sometimes with a tinge of pink. Seeds will live for 20 or more years in the soil.

Other common names: White Dutch clover.

Dandelion (Taraxacum spp.)

Cool season perennials common throughout the region. The yellow flowers occur from early spring to late fall. The thick fleshy taproot, often branched, can give rise to new shoots. Seedlings may appear throughout the spring and summer and are often abundant in the fall.



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Dandelion

Deadnettle (Lamium purpureum L.)

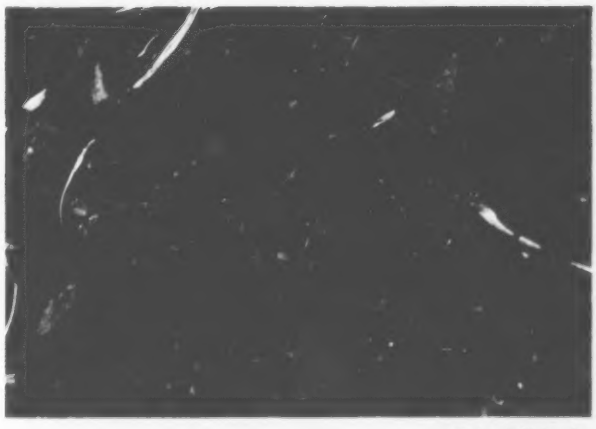
A winter annual that starts growth in early fall. Slightly pubescent throughout. The squarish stems may be upright or spreading. Leaves are opposite with scalloped edges. Flowers purple red.

Purdue University

Deadnettle

Dock (Rumex spp.)

Dock seldom flowers when growing in lawns. The plant forms a large rosette. Curly dock (Rumex crispus L.) is most common. The leaves have crinkled edges. They are often tinted with red or purple color. Pale dock, also known as tall dock (Rumex altissimus Wood.), has leaves which tend to be more flat and broad. Both species have flowering stalks that may reach a height of two to three feet.



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Dock

Uni. of Missouri

Wild Garlic

Garlic, wild (Allium vineale L.)

The slender, smooth, leaves are hollow and attached to the lower portion of the waxy stems. Both bulbs and bulblets are produced underground and the green to purple flowers are often replaced with bulblets. There is a characteristic onion-garlic odor.

Wild onion is similar to wild garlic but does not produce underground bulblets and the leaves are not hollow.

Uni. of Nebraska

Henbit

Henbit (Lamium amplexicaule L.)

A winter annual that starts growth in September. Stems are squarish; plants usually upright. Flowers are lavender to blue. Leaves are opposite. A few plants may bloom in the fall but the majority blossom in early spring.

Uni. of Nebraska

Ground Ivy

Ivy, ground (Glechoma hederacea L.)

A cool season perennial originally introduced as a ground cover. Now a weed in many lawns. Thrives in shade, but will also grow in the sun. Ground ivy produces an abundance of lavender to blue funnel-form flowers in early spring. The square stems may root at each joint where they touch the ground.

Other common names: Creeping Charley.

Knotweed, prostrate (Polygonum aviculare L.)

An annual that thrives from early spring to late fall. Germination occurs in very early spring. Grows flat from a long white taproot. Individual plants may have a spread of 2 feet or more. Stems wiry, very leafy; at each leaf node there is a thin papery sheath. Leaves often have a bluish cast. Seeds are three-cornered, light-brown early and shiny black at maturity

Uni. of Nebraska

Prostrate Knotweed

Kochia (Kochia scoparia L.)

A versatile annual capable of adapting itself to a wide variety of environmental conditions. In lawns it assumes a prostrate habit of growth; if not mowed it may attain a height of 7 or 8 feet. The first leaves after germination are covered with a silvery pubescence. Germination starts in early spring and continues throughout the summer. Leaves and stems vary in color from greenish yellow to greenish red.

Other common names: Burning bush, summer cypress, Mexican fireweed.

Uni. of Nebraska

Kochia

Mallow (Malva spp.)

Common mallow (Malva neglecta Wallr.) and dwarf mallow (Malva routoundifolia L.) are the most prevalent species. The long fleshy taproot is almost white. Flowers are bluish white. The seed portion is a flattened disc which breaks into 10 to 20 pie-shaped segments.

Other common names: Roundleaf mallow; cheeses.

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Mallow

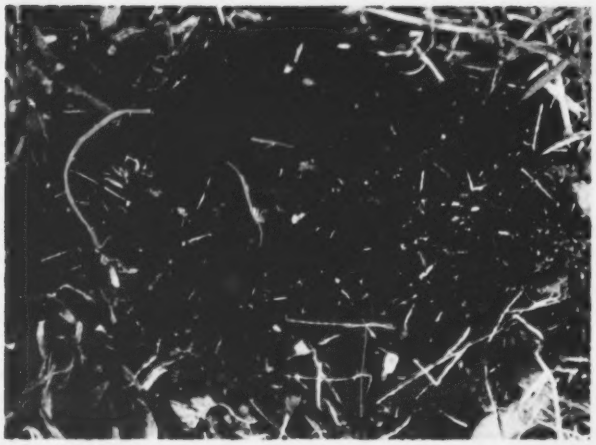
Uni. of Nebraska

Black Medic

Medic, black (Medicago lupulina L.)

An annual legume with trailing stems that grow close to the ground. The taproot penetrates deeply into most soils. The three-leaflet leaves have prominent veins and are similar to most other clover leaves. The small clusters of flowers are bright yellow. Seed pods turn almost black at maturity. Black medic is most noticeable in lawns during June, July, and August.

Other common names: Yellow trefoil; Japanese clover.



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Moss

Moss

A primitive form of plant life consisting of many genera and species. Moss prefers an environment that is cool and moist. It is most often found in shaded areas such as the north side of buildings and on poorly drained soil.

Uni. of Nebraska

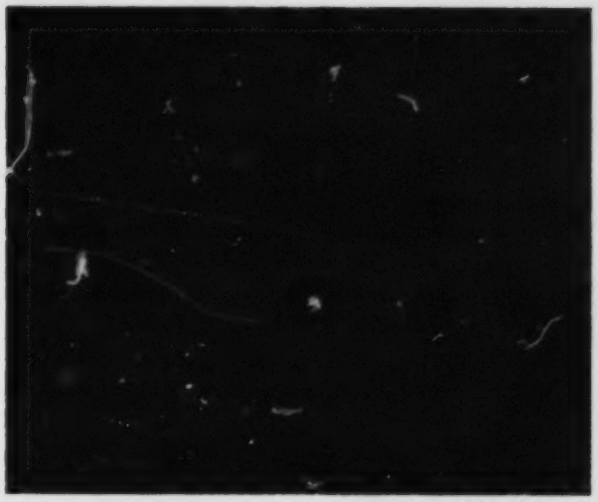
Prostrate Pigweed

Pigweed, prostrate (Amaranthus graecizans L.)

A warm season prostrate annual that grows from a pink taproot. The leaves are very shiny. Stems smooth, light-green to reddish green, may spread 1½ to 2 feet. Seeds are lens shaped, small, and shiny black.

Plantain, Blackseed and broadleaf

Cool season perennials that form rosettes with prominently veined leaves. The leaves of blackseed (Plantago rugelii Denc.) are oval shaped and 2-3 inches across with purplish stalks; broadleaf plantain (Plantago major L.) has smaller leaves without purplish coloration. Both species have rat-tail like seed heads that are several inches long.

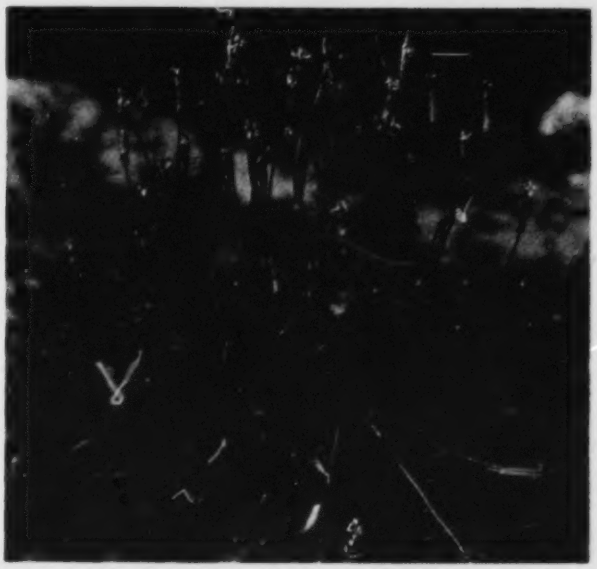


Uni. of Georgia

Plantain

Plantain, buckhorn (Plantago lanceolata L.)

Perennial. Has slender, narrow leaves that are about one inch across with 3-5 prominent veins. The seed head is a short cylindrical spike.



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Buckhorn Plantain

Punctureving (Tribulus terrestris L.)

A prostrate freely branching warm season annual. Plants slightly hairy. Some stems may be four or five feet long. Taproot. Leaflets bright green. Flowers yellow. Seeds angled, each with 2 stout spines that give a Texas longhorn appearance.

Uni. of Nebraska

Punctureving

Uni. of Nebraska

Purslane

Purslane, common (Portulaca oleracea L.)

A warm season annual. Leaves and stems fleshy or succulent, reddish in color. Grows prostrate. Root system tends to be fibrous; stems root wherever they touch the ground, particularly if the main root has been destroyed. Flowers small, yellow. Seeds very small, black.

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Shepherdspurse

Shepherdspurse (Capsella bursa-pastoris L.)

A winter annual. The deeply lobed leaves form rosettes in the fall that may be confused with dandelions; however, the leaves lack the milky sap. Blooms in very early spring. White flowers develop into triangular seed pods filled with numerous tiny reddish brown seeds. Individual seed pods held by their small stems resemble the purse once carried by shepherds.

Uni. of Nebraska

Red Sorrel

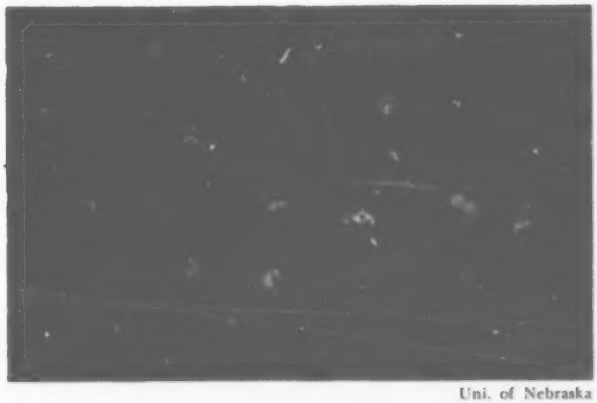
Sorrel, red (Rumex acetosella L.)

A low growing, cool season perennial that reproduces by creeping roots and seeds. Leaves are spear shaped. The lacy flowering stalks bloom in mid-spring with a definite reddish color. The seed is small, three-sided and reddish brown. Remains green from very early spring to early winter.

Other common names: Sheep sorrel.

Speedwell (Veronica spp.)

Several weedy species exist, most being winter or early spring annuals. Plants very low growing; leaf shapes vary with species but generally are small and numerous; flowers are light blue with white throats. Seed pods are divided and almost heart-shaped.



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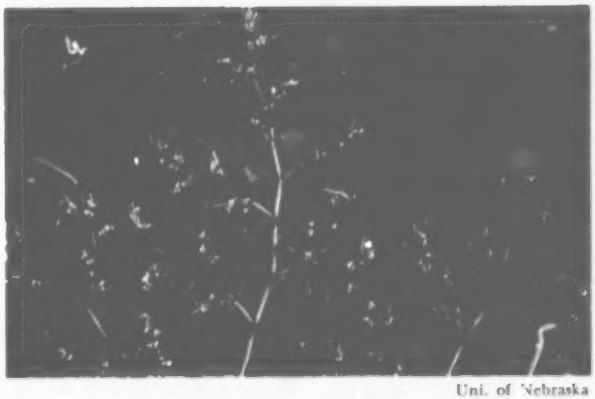
Speedwell

Spurge, prostrate (Euphorbia supina, Raf.)

A prostrate growing warm season annual. Most prominent in July, August, and September. Milky sap; leaves with or without reddish brown spots. Seeds are borne in three's in a capsule.

Other common names: Milk spurge.



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Prostrate Spurge

Thistle, Canada (Cirsium arvense L.)

Perennial. May spread by horizontal roots. Leaf form may vary. Most varieties have dark green spiny lobed leaves with crinkled edges. Most common in the northern half of the region. The lavender flowers are ¾" or less in diameter.

Uni. of Nebraska

Canada Thistle

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Musk Thistle

Thistle, musk (Carduus nutans L.)

A biennial found in lawns as a rosette. Leaves are free of hair and have a light colored midrib. Leaf margins are usually edged in grey-green. Spiny. Flowers are large, powder puff in shape, and usually deep rose to violet in color.

Other thistles found in lawns include flodman (Cirsium flodman Rydb.) and bull (Cirsium vulgare Savi.).

Nebr. Dept. of Agric.

Prostrate Vervain

Vervain, prostrate (Verbena bracteata Lag.)

A warm season annual that may on occasion act as a perennial. Low growing, hairy throughout. Stems branch freely in all directions, forming circular patterns of growth. Leaves vary in size and form, often are wedge-shaped and toothed. Taproot. Small funnel-form flowers are blue to purple.

Uni. of Nebraska

Violet

Violets (Viola spp.)

Cool season perennials that are among the first plants to bloom in the spring. Prefer at least partial shade. Flower color varies from very light blue to deep purple. Occasionally become troublesome in lawns. Numerous species common to our region.

Waterleaf (Ellisia nyctelea L.)

Cool season spring annual. Grows almost entirely in the shade of trees, shrubs and herbaceous perennials. Small white flowers; leaves are grey-green.

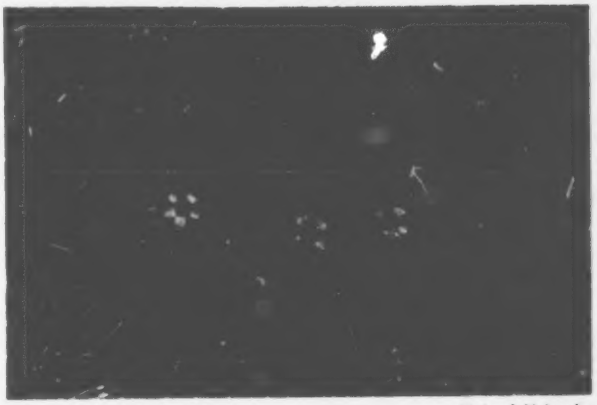
Other common names: Ellisia, nyctelea, waterpod.

Uni. of Nebraska

Waterleaf

Woodsorrel, yellow (Oxalis stricta L.)

Classified as a perennial but more often performs as a warm season annual. Stems branch from the base. The leaves are palmately divided into three leaflets giving a cloverlike appearance. Funnel-form flowers are yellow (in some species violet). The seed pod is cylindrical, 5-sided and pointed. The plants contain soluble oxalates which give it a rather pleasing sour taste.



Uni. of Nebraska

Yellow Woodsorrel

Yarrow, common (Achillea millefolium L.)

Perennial. May grow one to two feet tall. Leaves are soft, finely divided, fern-like. Stems and leaves are covered with grayish-green fine hairs. Flowers are mostly white forming a flat flower-cluster. Entire plant is rather strongly scented.

Western yarrow (Achillea lanulosa Nutt.) also is common in the region.

Purdue University

Yarrow

Management as a Weed Control Tool

Proper management can do much to encourage lawn grasses and discourage weeds.

Mowing at a height of 2 to 3 inches shades the soil and protects bluegrass roots from damaging effects of summer heat. High mowing of common Kentucky bluegrass is an excellent deterrent to the germination and growth of many annual weed species. Some of the newer lawn grasses perform best when mowed less than 2 inches.

Feeding programs that furnish lawn grasses with necessary plant food elements throughout the growing season tend to discourage weeds through competition furnished by more vigorous turf. Fertilize cool season grasses in the fall and spring and as needed during the summer months.

Withhold spring fertilization of *warm* season zoysia, buffalo, and Bermuda until May 1; stop fertilizing them about mid August.

Watering will aid grass to survive drought periods. Water bluegrass as soon as it develops a blue-green cast. Applications of water before moisture shortage symptoms appear is desirable. Soak soil to a depth of 5 inches. Avoid light sprinklings.

Seed and sod free of weed seed and off-type grasses is one of the first steps in weed control. Many lawns contain undesirable coarse grasses and weeds because they were present in the sod or seed. If you buy grass seed, study the label to make certain undesirable weeds and grasses are not present. Cultivated sod, inspected and treated to reduce weeds, is becoming more plentiful.

Control Methods

Mechanical Control

Digging and pulling are simple, effective ways of controlling a few scattered weeds. Dandelions should be cut 2″ to 4″ below the crown to reduce regrowth. Pulling of most species works best following a heavy rain or after deep watering.

Undercut and cut around small patches of undesirable grass with a sharp spade. Lift the undesirable patch and use it as a pattern to cut a replacement piece the same thickness from an inconspicuous place elsewhere in the lawn. Make certain the replacement sod is firmed into place and well watered until it becomes established.

Preemergence Weed Control

Chemicals applied to the soil to stop growth of seed are preemergence herbicides. They work best on annuals and also control some perennials starting from seed. Most preemergence products have little effect on emerged seedlings.

Proper lawn preparation is essential for optimum performance of preemergence products. Preparation for preemergence chemicals includes three simple steps:

1. Remove trash, leaves, and excess dead grass from the lawn. If power raking is planned, do it as part of the lawn preparation for preemergence chemicals.

2. Apply the preemergence product as directed on the bag or container. Distribute evenly. Double coverage at half rate in two directions assures more even distribution than a full rate applied in a single application.

3. After application, water the lawn. Watering moves the chemical into the soil where it can perform the intended job on germinating weed seeds.

Table 1 shows the most effective times of application. In general, preemergence applications are made in the very early spring for the control of cool season weeds and in mid-spring for warm season annuals.

Products designed for preemergence weed control are labeled "Preemergence," "Preemergent" or "Preventer." Most preemergence herbicides sold for lawn use are bought as granules ready for application. The amount of active ingredient per 1,000 square feet or per acre is given as an aid for treating large areas with concentrated formulations.

READ CAREFULLY!

The following herbicides labeled for use on lawns and other turf were registered with the Environmental Protection Agency (EPA) at time of publication. The registration status of herbicides and other pesticides is continuously reviewed by manufacturers and EPA and subject to change. Read the product label before purchasing to make certain it is registered for your need. To use a pesticide in any way that is inconsistent with the label is a violation of Federal law. Most farm and ranch herbicides are not labeled for use on turf. Such products applied to turf would be use inconsistent with the label and a violation of the Federal Environmental Pesticide Control Act of 1972.

Arsenicals, usually in the form of arsenic trioxide, lead arsenate and calcium arsenate, are used for long term control of crabgrass and other annuals in turf. The compounds are highly toxic to warm-blooded animals. Safer products are available for homeowners. Injury to bluegrass also has been observed. Arsenicals act by replacing phosphorus, an essential plant food nutrient, in seedling grasses. The main use of arsenicals is by turf managers for crabgrass and annual bluegrass control.

Balan has the common name benefin. It controls annual grasses in most perennial turf grasses but should not be used on bentgrass. Use only on well established turf. Do not reseed until six to eight weeks after application. Suggested rate is 1½ lb active ingredient per acre or ½ ounce per 1,000 sq. ft.

Betasan is an organic phosphate herbicide aslo known as bensulide. It controls annual grasses in established cool season turf. Reseeding should not be attempted for 4 months after application. Suggested rates are 12 lb active ingredient per acre or 5 lb of 3¼% granules per 1,000 sq. ft.

Dacthal has the common designation DCPA. It is especially effective on germinating grasses and also the

seed of certain broadleaf species including chickweed and purslane. Dacthal is used extensively for weed control in ornamentals, small fruits, and in some farm crops. Do not use on new grass until after the first mowing. Reseeding to grass should be delayed for 10 to 12 weeks after using. Suggested rate is 10 to 12 lb active ingredient per acre or 6 oz. of 75% wettable powder per 1,000 sq. ft.

Tupersan is a substituted urea compound known also as siduron. It effectively controls most annual warm season weedy grasses and has the unique quality of not interfering with the germination of newly seeded cool season perennial grasses which include bluegrass. On established turf, use 10 to 12 lb of active ingredient per acre or 8 oz. of 50% wettable powder per 1,000 sq. ft.

Postemergence Chemical Control

The application of weed killers to unwanted emerged plants is referred to as postemergence weed control. 2-4-D, dicamba, silvex, MCPA and MCPP weed killers are selective postemergence herbicides. They selectively control broadleaf weeds and have little or no effect on desirable lawn grasses.

Many selective herbicides are growth regulators. They interfere with the normal processes within some plants by upsetting delicate hormone balances. These imbalances result in distorted growth and ruptured cells. Food movement is impaired and eventually death results.

Hormone-type herbicides, if not properly used, can cause injury or kill desirable flowers, shrubs, trees, and gardens.

The more common postemergence herbicides include:

2,4-D (2-4-dichlorophenoxyacetic acid), a growth regulating hormone compound. 2,4-D is formulated principally as salts and esters and sold under a wide variety of trade names. It is available as liquids, tablets, powders, wax bars and granules. The use of ester formulations should be avoided because of the hazards of fume damage to other plants in the vicinity.

Silvex (2,4,5-trichlorophenoxypropionic acid) like 2,4-D belongs to the phenoxy group of herbicides. It is sometimes referred to as 2,4,5-TP. Silvex controls some species more effectively than 2,4-D.

MCPA (2-methyl-4-chlorophenoxyacetic acid) and **MCPP** or mecoprop (2-methyl-4-chlorophenoxypropionic acid) are herbicides similar to 2-4-D and silvex. At higher rates, they are less likely to cause noticeable adverse effects on grasses than similar rates of 2,4-D and silvex.

Dicamba (3,6-dichloro-o-anisic acid) is sold as Banvel or in mixtures with other herbicides such as 2,4-D and MCPP. Its activity in plants is similar to the action of 2,4-D. Severe injury can occur to desirable trees, shrubs and other ornamentals through root uptake particularly from granular formulations. Banvel is especially effective on clovers, chickweeds, knotweed and red sorrel.

Dalapon (2,2-dichloropropionic acid) is sold under the trade name Dowpon. It shows greatest activity on grasses. Dalapon must be used as a "spot treatment" on clumps or patches of undesirable grass since it is not selective and kills all grasses.

Arsonates are also known collectively as organic arsenicals. The principal products are DSMA (disodium methanearsonate), MSMA (monosodium acid methanearsonate) and MAMA (monoammonium methanearsonate). The arsonates are used to control annual grassy weeds such as crabgrass and foxtail found in perennial grasses. They kill mostly by foliage contact but also move within some plants to a limited extent. Arsonates have proven effective for nutsedge control. Don't confuse these much safer organic arsenicals with the more toxic inorganic arsenicals such as sodium arsenite, lead arsenate, and calcium arsenate.

Amitrole (3-amino-1,2,4-triazole) inhibits chlorophyll formation in plants. It is used for spot treatment to destroy undesirable plants and for total vegetation control.

Cacodylic acid (dimenthylarsinic acid) destroys vegetation upon contact and is used for total vegetation control. Several applications are necessary for control of persistent perennials such as smooth brome and tall fescue.

Herbicide Formulations

Postemergence herbicides are applied as liquids and solids.

Liquids—Esters and Salts

Liquids of the hormone type are normally esters or amine salts. Ester formulations may be low-volatile or high-volatile. Low volatile esters release a minimum amount of fumes at temperatures below 85° F.; high volatile esters give off fumes at lower temperatures. Air temperatures can be misleading since temperatures at the lawn surface may be 20 to 40 degrees higher. Salt formulations — lithium and amine—are less hazardous because they do not give off damaging fumes.

No ester formulation is safe to use around ornamentals because of volatilization or vapor hazards.

Wind movement of spray particles is equal on both esters and salts.

Read labels carefully and select the very safest formulations and products available. Proper use begins with selection of the correct weed killer and a safe formulation.

Under no condition should it be necessary for a homeowner to control weeds with highly toxic products. Such products bear the skull and crossbones and the word "Danger" on the label. Avoid their use.

Solids—Bars and Granules

Solid formulations commonly available are granules and wax bars. Both of these formulations provide effective weed control and reduce risk to desirable ornamentals and vegetable gardens.

Granular formulations work most satisfactorily when applied in late evening or early morning, when weed species are damp. Sprinkling with water before application also provides the necessary conditions for granular adherence

and effective control.

Follow directions closely when using wax bar formulations. Temperatures above 85° F. can cause excessive application and "scorching" of the lawn grass.

Liquid Application

Liquid applicators can be classified into two groups—gravity flow and pressure.

Gravity Flow

Gravity flow liquid applicators are most desirable for the average homeowner. They are simple to operate, low in upkeep and initial cost, and eliminate drift of fine droplets of spray which could cause damage to ornamentals, fruits, and vegetables.

The simplest and least expensive gravity flow applicator is a plastic **sprinkle nozzle** that fits into a gallon jug. The jug is filled with the proper mixture of water and weed killer. When inverted, the mixture comes out in a uniform spray. Precision application can be obtained by first making a test run with water to determine the area covered at the normal walking speed.

Cane tubes equipped with a push type dispenser on the bottom end are popular for treating a few scattered weeds. Cane tubes are usually about 30" long. They are filled with water and herbicide. When the cane tube is pressed down on a plant, the dispenser releases a squirt of weed killer mixture. Premeasured weed killer tablets are available for use in cane tubes; however, liquid formulations will serve just as satisfactorily.

Liquid spreaders work on the same principle as granular applicators. The most successful type employs a whirling disc which "throws" the weed killer mixture in a precision pattern.

"Brush and can" systems are convenient methods for treating small patches or a few individual plants. The herbicide mixture is simply "painted" or "daubed on" plants marked for elimination. The "brush and can" method works well for spot treating unwanted clumps or patches of grass. Use an inexpensive paint brush or a cloth or sponge dauber.

Pressure Systems

Pressure applicators are of two types—air pressure and water pressure. Air pressure sprayers require a sealed tank, pump, and nozzle. Water pressure sprayers are commonly known as "hose end" sprayers. They use water pressure to force distribution of the material.

Misuse of pressure type applicators accounts for a considerable share of the weed-killer spray drift injury that occurs in urban neighborhoods. When using pressure sprayers, operate the equipment with as low a pressure as possible. Lower pressures increase spray droplet size and thereby reduce the possibility of drift. *Never operate pressure spray equipment in urban areas when wind movement is greater than 5 mph.*

The application of herbicides with hose-end units is difficult to control. Wrestling with the water hose and lack of precision placement with hose-end applicators makes for misapplication.

The use of gravity flow units is encouraged for herbicide use. Save hose-end units for the application of insecticides, fungicides, and liquid fertilizers.

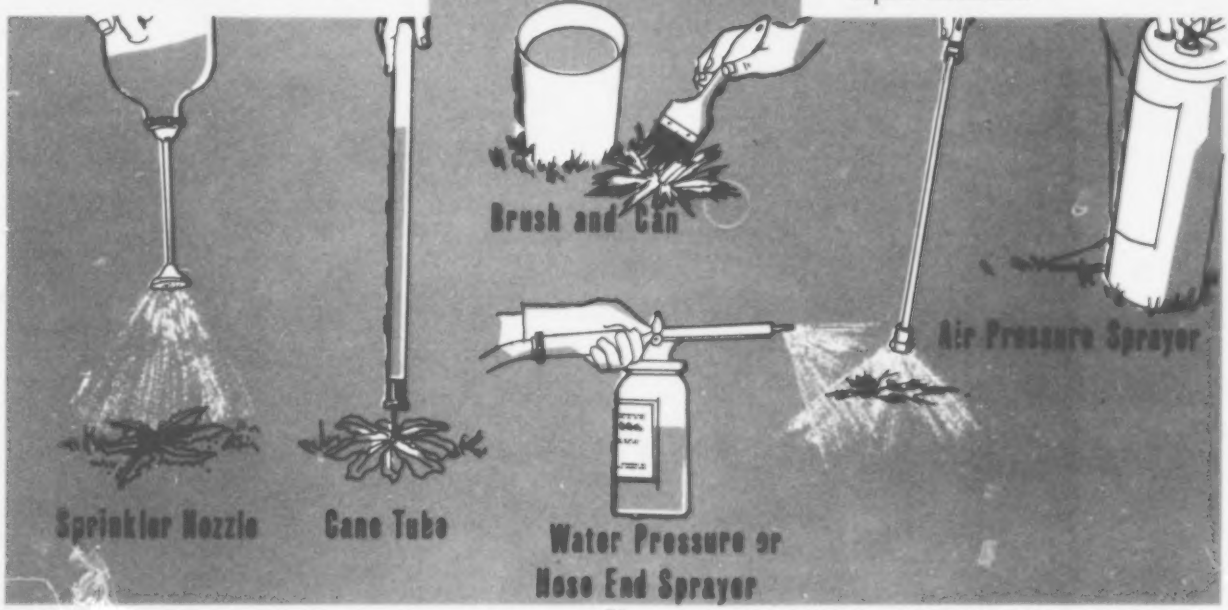
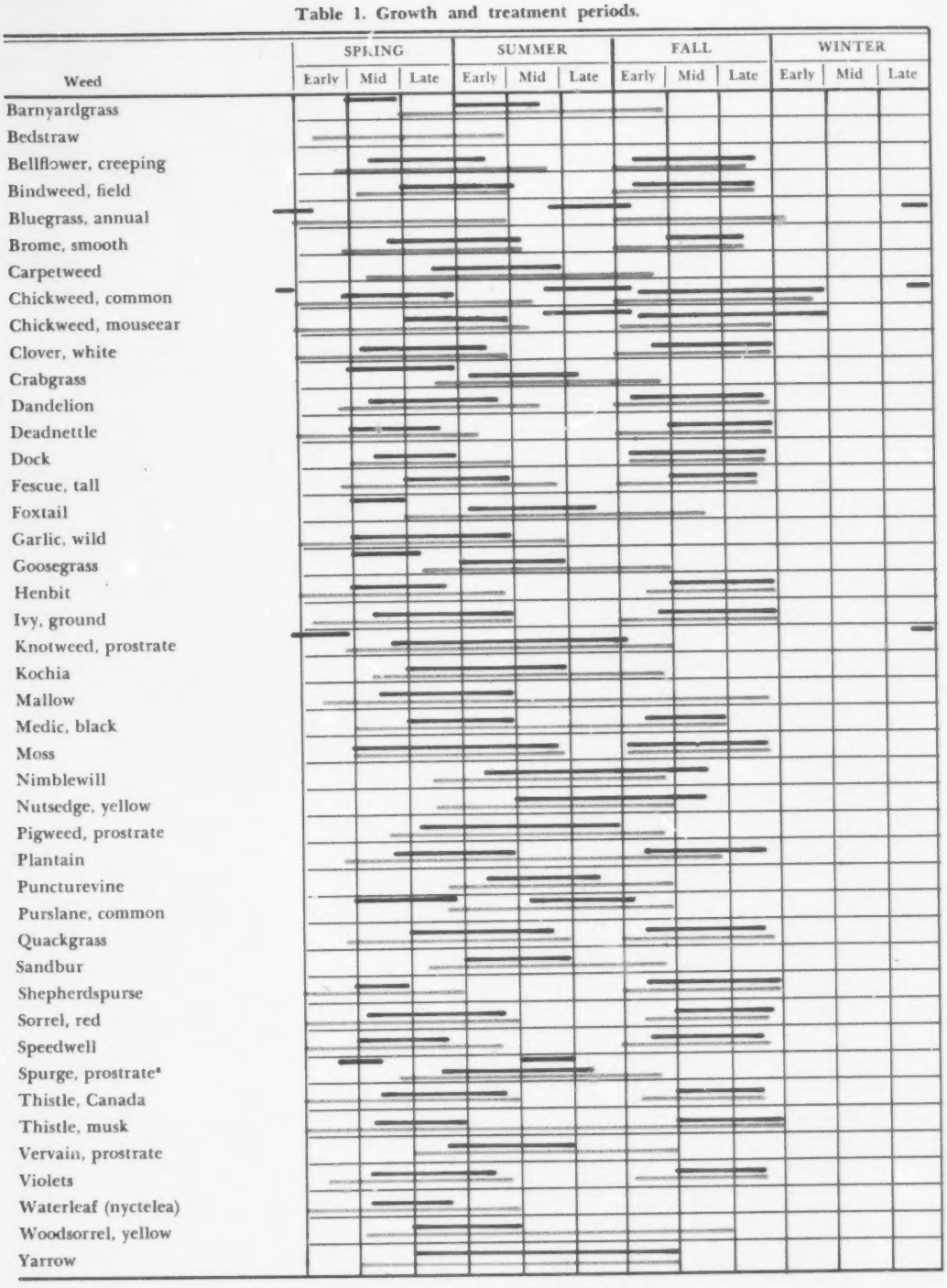


Table 1. Growth and treatment periods.



= Active period of plant growth. Varies from year to year and from north to south.

= Apply preemergence chemicals.

= Apply postemergence treatments. Approximate periods may vary two weeks from season to season. Use granular or wax bar formulations of 2,4-D, Banvel and Silvex from late spring through early fall.

[a] Preemergence herbicide applications of Dacthal should be made a second time in late June or early July.

Table 2. Weed response to herbicides.

Weed	Preemergence[a] control	Postemergence control[b]	
		1st choice	2nd choice
Barnyardgrass	Yes	Arsonates	
Bedstraw	No	Silvex	Banvel
Bellflower, creeping	No	Banvel	
Bindweed, field	No	2,4-D	Banvel
Bluegrass, annual	Yes		
	Betasan, Dacthal		
Brome, smooth	No	Banvel[c]	Dalapon[d]
Carpetweed	No	Banvel, Silvex	2,4-D
Chickweed, common	Some	Silvex, Banvel	Arsonates
Chickweed, mouseear	Some	Silvex, Banvel	Arsonates
Clover, white	No	Silvex, Banvel	
Crabgrass	Yes	Arsonates	Kerosene[e]
Dandelion	Seedlings	2,4-D	
Deadnettle	No	Banvel	
Dock	No	Banvel	2,4-D
Fescue, tall	No	Dalapon[d]	
Foxtail	Yes	Arsonates	
Garlic, wild	No	Banvel	2,4-D
Goosegrass	Yes	Arsonates	
Henbit	No	Silvex	Banvel
Ivy, ground	No	Silvex	Banvel, 2,4-D
Knotweed, prostrate	Yes	Banvel	2,4-D (early)
Kochia	No	2,4-D	
Mallow	No	2,4-D (Fair)	
Medic, black	No	Silvex	Banvel
Moss	No	Cu So_4[f]	
Nimblewill	Seedlings	Arsonate + 2,4-D[g]	Dalapon[d] or amitrole[d]
Nutsedge, yellow	No	Arsonates	
Pigweed, prostrate	Some	2,4-D	Banvel
Plantain	No	2,4-D	Silvex
Puncturevine	No	2,4-D	Oil (wet plants)
Purslane, common	Yes	Banvel	Silvex
	Benefin, Dacthal		
Quackgrass	No	No selective chemical	Spot treat with dalapon[d]
Sandbur	Some	Arsonates	
Shepherdspurse	No	2,4-D early	
Sorrel, red	No	Banvel	
Speedwell		Dacthal[h]	Banvel
Spurge, prostrate	Dacthal[i]	Banvel	Silvex
Thistle, Canada	No	Banvel	2,4-D
Thistle, musk	No	2,4-D	
Vervain, prostrate	No	2,4-D	
Violet	No	Silvex	
Waterleaf (nyctelea)	No	Silvex	
Woodsorrel, yellow	Seedlings	Banvel	Silvex
Yarrow	No	Banvel	

[a] See Pages 19–20 for discussion of herbicides commonly sold for preemergence control. Products are listed where superiority has been noted on specific weeds. Follow manufacturer's recommendations on rates.

[b] Follow manufacturer's recommendations on rates. Use wax bars and granular formulations of 2,4-D, Banvel and silvex from late spring through early fall to reduce danger of herbicide drift and injury to trees, shrubs, and gardens. Banvel injury to susceptible plants can occur by root uptake.

[c] Treat individual plants. *Do not* spray entire lawn. Use 6 tablespoons Banvel concentrate per gallon of water and apply as a wetting spray.

[d] Treat individual plants. Do not spray entire lawn. Dalapon and amitrole kill all grasses. Use ¼#/gal. water.

[e] 1 quart of white kerosene per 100 square feet.

[f] 1 ounce copper sulfate per gallon of water to 200 square feet.

[g] Arsonate at heaviest crabgrass control rate, 2,4-D amine at dandelion rate. Make three treatments 10 days apart.

[h] Preliminary results favorable. Use 6 ounces Dacthal 75W per 1,000 square feet.

[i] A second preemergence treatment in late June or early July is necessary.

Use Pesticides Safely

FOLLOW THE LABEL

—Identify your weed problem.

—Select the proper weed killer for the job and season (Table 2). Consider safety to humans, pets, lawns, and ornamentals.

—Study the container label, accompanying literature, and bulletins.

—Carefully check weather conditions.

—temperature

—wind velocity and direction

—Consult with neighbors before making application.

—Apply exactly as directed.

—Clean up afterwards

—wash exposed portions of the body

—clean equipment

—change clothes.

—Safely dispose of empty containers.

—Keep and store all pesticides in their original labeled containers out of the reach of children and irresponsible adults.

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SPECIAL THINGS TO CONSIDER WHEN APPLYING ORNAMENTAL AND TURF PESTICIDES

POTENTIAL FOR PHYTOTOXICITY

Phytotoxicity, or pesticide damage to plants, results in such things as abnormal growth, leaf drop, and discolored, curled, and spotted leaves. If phytotoxicity is severe, the plant may die. Phytotoxicity often mimics such things as insect damage, plant disease, and response to poor growing conditions such as insufficient moisture, improper fertilization, etc. The following items are especially relevant to the phytotoxicity problem:

--A wide variety of plant material.

--Pesticide drift.

--Pesticide persistence beyond the intended period of pest control.

Wide Variety of Plant Material

Ornamental plants vary from herbaceous to semi-woody and distinctly woody species. Generally, herbaceous plants (chrysanthemums, petunias, turfgrasses, etc.) are more susceptible to pesticide damage than woody ones. Even the woody plants are more susceptible when growth is young and tender. Greenhouses present a special problem as phytotoxic vapors tend to be trapped in the closed environment.

Plant damage is more likely to occur with herbicides. Fungicides, except those applied as smokes, tend to be less hazardous to plants than herbicides and insecticides. The pesticide label is the best guide to the safe use of pesticides on a specific ornamental plant. If the pesticide is not known to be safe for use on a specific ornamental plant, it should not be used. Since the registration status of pesticides is continuously being reviewed and is subject to change, read the product label before purchasing to make sure it is registered for your need.

Where different plants are rotated in the same soil, a pesticide used to control some pests on one plant may leave residues in the soil that will damage or kill another plant. This is especially true of some herbicides. Also, shrubs and ground covers may be injured by weed killers applied to adjacent turf areas. Other examples of injuries that may be caused by careless spraying are as follows:

Carbaryl (Sevin) injures Boston Ivy.

Bordeaux Mixture may injure certain succulent plants and russet some apple varieties.

Chlorobenzilate may damage hydrangea.

Demeton (Systox) will defoliate Bechtel's double flowering crab.

Diazinon injures ferns, hibiscus, gardenias, stephanotis, and African violet.

Dimethoate (Cygon) causes defoliation of honeylocust and elm. It may also injure flowering almond, dahlias, plum, peach, cherry, chrysanthemum, or Chinese holly.

Ethion will injure yews or redbud.

Lead arsenate may defoliate Viburnum carlesi, forsythia and flowering peach.

Malathion injures canaert, sargent's and burk junipers, Japanese holly, ferns, violets, petunias, and the rose varieties Caledonia and Talisman.

Oil-sensitive plants include beech, black walnut, butternut, hickory, mountain ash, Japanese maple, red maple, sugar maple, yellow wood, Russian olive, Norway spruce, yews, hemlock, magnolias, redbud, broadleaved evergreens in general and junipers.

Ovex (Ovotran) is toxic to azaleas, beech, boxwood, barberry, deutzia, hollies, raspberry, oak, hawthorn, spruce and sycamore.

Phorate (Thimet) distorts new growth of Eleyi crab apple trees.

Phosphamadin causes defoliation of thornless honeylocust.

Sulfur is toxic to viburnums and forsythia.

Tedion (tetradifon) may injure some varieties of roses.

Thiodan (endosylfan) may injure geraniums.

Toxaphene will injure linden, oak, redbud, sugar maple, plum, grape, peach, and pear trees.

Warm season turfgrasses include the bermudagrasses, zoysiagrasses, St. Augustinegrass, and centipedegrass, as well as some varieties which have been developed from these species. Cool season species include such plants as the bluegrasses and fescues. Some herbicides used to control weeds in warm season grasses will damage or destroy cool season grasses. The pesticide label is the best guide as to whether the pesticide should be used on a specific turf species.

Drift Problems

The proximity of different plants with varying susceptibility to pesticide damage requires that commercial pesticide applicators in the ornamental and turf category be especially aware of drift problems.

Two types of drift are associated with pesticides. The most common, drift of spray droplets or dust particles, is directly affected by such things as spray pressure, nozzle opening size, wind velocity, and pesticide formulations. Drift of a chemical with low vapor pressure is termed "vapor drift." Vapors or gases can drift in harmful concentrations--even in the absence of wind. Fumigants such as methyl bromide must be confined so they will not drift from the treated area (proper sealing with a plastic tarp is essential). Some pesticide products are volatile or capable of vaporizing from soil and leaf surfaces in potentially harmful concentrations after application. Herbicide vapor can severely damage and even kill desirable plants.

There are several steps that can be taken to prevent damage to non-target plants. Where several pesticides are available, the applicator should strongly consider the hazard and toxicity of the active ingredient in making a choice. He should use formulations and methods of application that will result in minimum drift. Pesticides should be selected that are safe for both target and nontarget plants if possible. It may be necessary to place a barrier around the target plant or remove susceptible plants from the area (such as removing susceptible potted plants from a greenhouse). Air blast sprayers can be used in ornamental and turf pest control if very safe (toxicity to applicator and nontarget plants is low) pesticides are used. Air blast sprayers should never be used to apply herbicides.

Persistence Beyond the Intended Period of Control

The period of pesticide residual activity varies greatly from one class of pesticides to another. Persistence is directly related to rate of application, soil type or texture, temperature, moisture conditions, rainfall amounts, and other factors. Commercial applicators must be familiar with persistence of each pesticide which may be applied to ornamentals and turf, especially where adjacent areas may be affected, treated soil is used to grow other plants, or where humans and pets frequent the area. An example of persistence causing a problem in plant handling would be the use of a highly toxic systemic insecticide on plants just before they are sold to the public. It is very possible that in the process of selecting a plant, the soil would be handled and the general public would be exposed to the active chemical. In situations such as this, it is necessary to hold the plants until the chemical has lost its toxicity. This information can be found on the label.

Persistence is an important part of pest control, since successful pest control requires a knowledge of the persistence period to make subsequent applications. For

example, generally herbicides used for pre-emergence weed control in turf persist for 60 to 90 days, and postemergence herbicides last from one or two days to three or four weeks, depending upon the specific herbicide involved.

Persistence can be an advantage to the applicator for long-term control of the pest. The use of a chemical to control Pythium (cottony blight) on turf or root rot on chrysanthemums is a situation in which pesticide persistence is desired. However, problems can develop when applications are made too frequently, raising the level of the chemical in the soil to potentially phytotoxic amounts.

MINIMIZING PESTICIDE HAZARDS TO HUMANS, PETS AND OTHER DOMESTIC ANIMALS

Turf and ornamental pesticides must often be applied in environments frequented by humans, pets, and other domestic animals. The pesticide applicator must be constantly alert to the hazard associated with this situation. Primarily, the problem is twofold: (1) he must prevent hazardous amounts of pesticides from drifting into nontarget areas, and (2) he must prevent humans, pets, and other domestic animals from contacting hazardous amounts of pesticides within the treated area. To avoid problems as much as possible, the following safety precautions should be followed:

--Double check to make sure you have the correct yard before spraying.

--Do not allow children or pets to remain in the area being sprayed.

--Check neighbors' yards to make sure there are no children or pets around who could come in contact with possible spray drift.

--Remove children's toys.

--Be sure all clothing is removed from area.

--Avoid spraying lawn furniture.

--Make sure all house windows are closed.

--Turn over pet dishes.

--Avoid fish ponds, bird baths and bird feeders.

--Observe pesticide label restrictions concerning tolerance for fruits and vegetables.

--Sweep or flush away all spray puddles.

--Secure all pesticide containers on spray apparatus before moving.

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